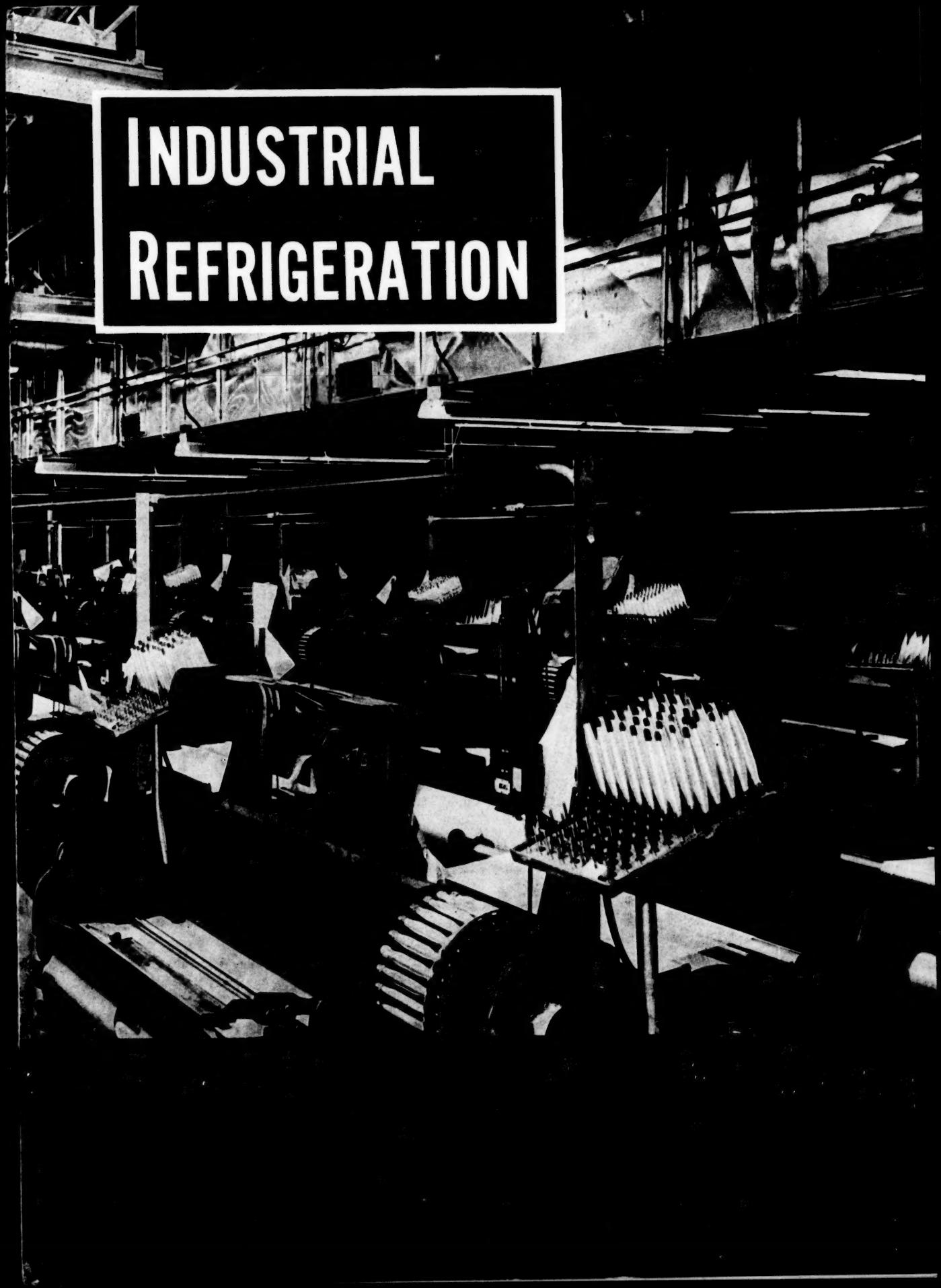
INDUSTRIAL
REFRIGERATION

SPECIFY

SPORLAN

LMC

and get

PEAK PERFORMANCE

on all Flooded Systems

with the

Sporlan

LMC

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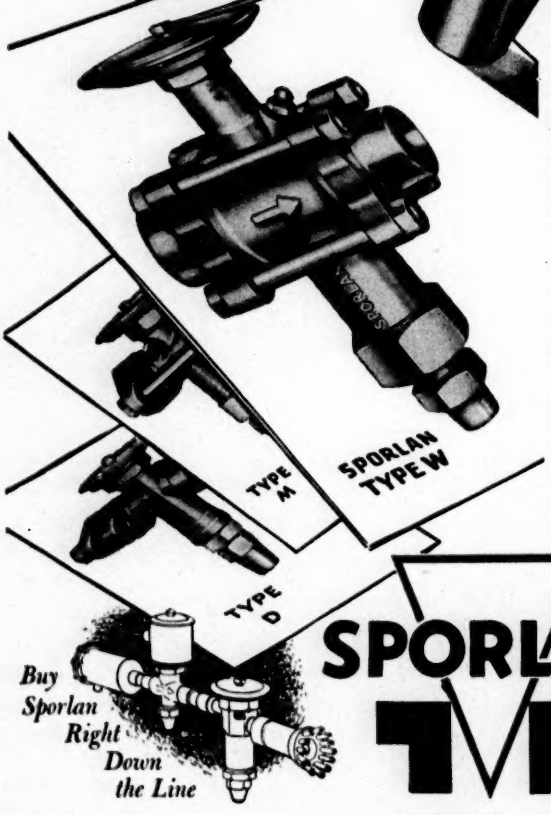

Buy Sporlan Right Down the Line

Again Sporlan offers you a NEW FIRST!...

A Positive Liquid Level Control for Ammonia, Freon-12, and Freon-22 with all these features!

First, the Sporlan LMC consists of a standard Sporlan Thermostatic Expansion Valve equipped with a matched Sporlan Level Master Element. That means that the liquid level control and the expansion device are combined into one unit, and you have a choice of Sporlan Thermostatic Expansion Valves for Freon-12 and Ammonia up to 100 tons, and for Freon-22 up to 180 tons... *thus no job is too large or small for the Sporlan* **LMC.** *Existing flooded systems can be easily and economically modernized and made automatic with the Sporlan* **LMC.** *The Sporlan* **LMC** *provides a* MODULATED FLOW *and maintains practically a static liquid level in the low side! The Sporlan* **LMC** *insert bulb has* NO MOVING PARTS!

Any two wire power supply of 115 or 230 volts, any frequency AC or DC, is adequate. The Sporlan LMC insert bulb can be installed in either a horizontal, vertical or angle position for direct contact with the refrigerant. If the liquid level drops, a heater element in the bulb acts as an artificial superheat increasing the pressure in the thermostatic element, thereby opening the valve. If the liquid level rises, its refrigerating effect on the bulb overcomes the heater, and the valve throttles.

The Sporlan **LMC** *is* NOT *affected by turbulance... tight closing* IS *assured... there is no current flow through refrigerant... and only proven thermostatic expansion valve performance is employed!*

WRITE TODAY FOR COPY OF BULLETIN 60-15...
THEN SPECIFY SPORLAN LMC FOR ALL YOUR FLOODED JOBS!

SPORLAN VALVE COMPANY

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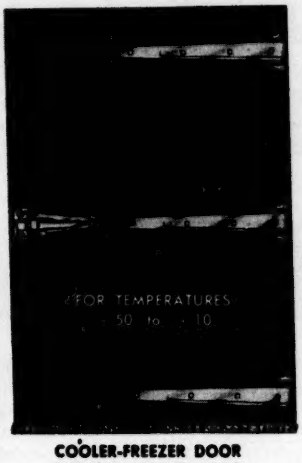
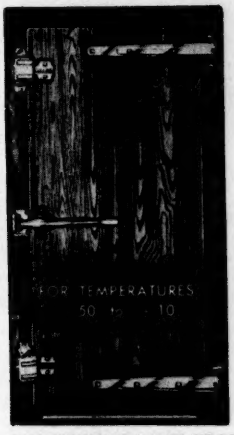
Circle No. 11 on Reader Service Card

Butcher Boy

REFRIGERATOR DOOR CO.



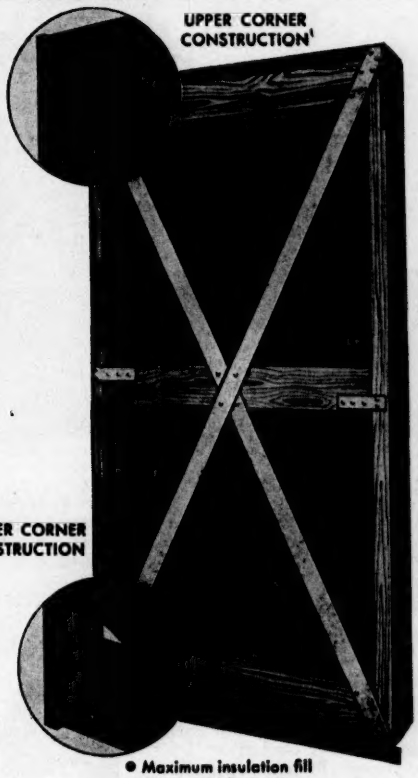
COOLER-FREEZER DOOR
- Modern streamlined job
- 100% "Douglas Fir"
- Sanitary hardware



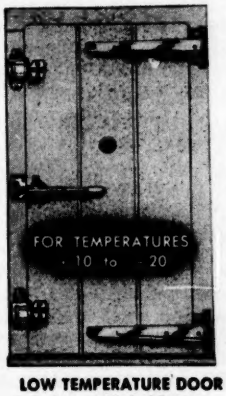
X-52 PLYWOOD PANEL DOOR
- Plywood front and back
- Extra heavy-duty hardware
- Special type gaskets

UPPER CORNER CONSTRUCTION

LOWER CORNER CONSTRUCTION

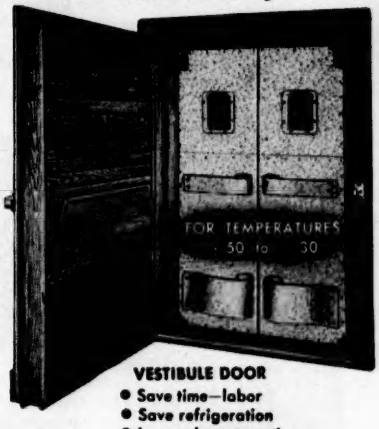


- Maximum insulation fill
- Most possible rigidity
- Allows reversal of swing



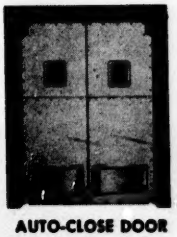
LOW TEMPERATURE DOOR
- Entire metal-clad front
- Extra heavy-duty hardware
- Special type gaskets

SUPER FREEZER (OVER-LAP) DOOR
- Extra-heavy construction
- Extra-heavy duty gaskets
- Extra heavy-duty hardware

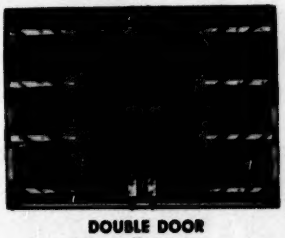


VESTIBULE DOOR
- Save time—labor
- Save refrigeration
- Large plant operation

TRACK DOOR
- For abattoirs
- Meat handling rails
- Banana rooms



AUTO-CLOSE DOOR
- For loading dock
- Intra-cooler doors
- Heavy trucking



DOUBLE DOOR
- For palletizing
- For carloading
- For elevator shafts

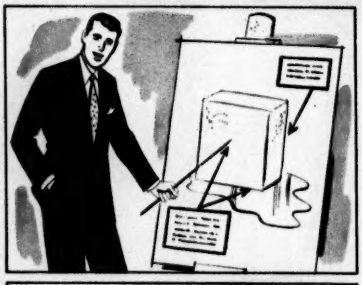
BUTCHER BOY REFRIGERATOR DOOR CO. • HARVARD, ILL.

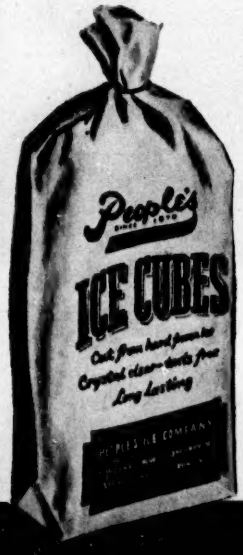
Circle No. 14 on Reader Service Card

TAKE A TIP FROM A COMPANY THAT'S MADE IT PAY

Mr. H. D. Sanford
President
People's Ice Company
Syracuse, N. Y.—Rome, N. Y.

"We now use about 300,000 Union Wet Strength Ice Bags a year. All ice cubes and a large part of our sized cracked ice are delivered in these popular one-trip containers."





FORMULA for success as demonstrated by People's Ice Company of Syracuse and Rome, N. Y. is simple: (1) quality product (2) quality package (3) smart promotion. People's features ice that is crystal clear, hard frozen, and long lasting... delivered in convenient, sanitary Wet Strength Paper Ice Bags.

PEOPLE'S actively merchandises advantages of its product to bars, fountains and restaurants, shows how liberal use of ice reduces cost of drinks, increases customers' enjoyment, and induces them to order additional rounds.

HARD facts show economy of People's "solid cubes" as compared with faster-melting ice. Company demonstrates how "home-made" machine cubes melt inside and out, have less density, show a 13% greater loss in storage, require more ice for same job.

PEOPLE'S representatives have all "hidden" costs of on-the-premises ice-making at their fingertips. "The modern way," they argue successfully, "is to have service rendered through packaged delivery . . . the same as you do with baked goods, vegetables and milk.

TRADE MARK UNION

Circle No. 15 on Reader Service Card

LETTERS

(Letters to the editor are welcomed from readers of INDUSTRIAL REFRIGERATION on any subject of general interest.)

Broader Field

Colorado Springs, Colo.

Our congratulations to the editors and publishers of Ice and Refrigeration on their change of format and title. The new name, INDUSTRIAL REFRIGERATION, is an excellent one because it names the field covered in a broad, inclusive and appropriate manner. Moreover, it suggests a change that has come about slowly but steadily over a period of years, the change from separate ice and refrigeration industries to large industrial use of controlled environment, including not only temperature but other factors and phases of atmosphere. Despite the change and the need for it, we will, along wtih many others, miss the familiar cover and title because they have been associated with service and progress over a long period, in fact, 62 years.—Dr. H. C. Diehl in TRRF Information Bulletin.

We Get the Bills

New Orleans, La.

As a regular reader of INDUSTRIAL REFRIGERATION, may I congratulate you on the new cover, size, and make up. It is a great improvement.

Enclosed is a sheet from the November issue (page 53, November issue). It seems to me unfortunate that headlines so often give credit where credit is not due. U.S.D.A. has never and never can "give" anything away; taxes pay for it.

A recent headline in our local paper praised an eastern shah for "giving" away part of his lands. The small print told that U. S. taxpayers were forced to contribute millions to this project. The shah gets the credit, and probably made money on the deal; we just get the bills.

ARTHUR M. HILL
Head Mechanical Engineering,
Tulane University

Striking Appearance

San Luis Obispa, Calif.

I want to compliment you on the very striking appearance of the September issue of INDUSTRIAL REFRIGERATION. You have done an outstanding job in developing a most appealing format.

HAROLD P. HAYES
Dean of Engineering
California State Polytechnic College

Industrial Refrigeration

formerly ICE AND REFRIGERATION

Now in its 62nd Year of Publication

J. F. NICKERSON, FOUNDER

VOL. 125 DECEMBER, 1953 NUMBER 6

Contents

Vacuum Precooling Vegetables 13
Textile Air Conditioning 15
Multi-Staging With Rotary Compressors 21
Portable Ice Skating Rink 28
Factors Affecting Keeping Quality of Carrots in Cold Storage 30
Automatic Control of Cooling Water Treatment 33
National Ice Association—Annual Convention 37
Florida Ice Association 42
Research on Icing Potatoes 53
Cold Storage Holdings 57
Freezing Storage of Bakery Products 59
National Association Practical Refrigerating Engineers 43
Forty-fourth Annual NAPRE Convention 43
Engineering Papers Presented at Annual NAPRE Convention 45
NAPRE Question Box 46
News Notes and Chapter Activities 47

Departments

Letters 3
What's New in Equipment 5
Press Briefs 8
News of People 60
Deaths 60
Manufacturers News 61

The Cover:

• Partial view of weave room in modern textile plant, showing arrangement of ventilation duct in air conditioning installation. Grille outlets are shown in back wall, with E S C pneumatic type water atomizers over each outlet. Atomizers relieve "humidity headache," characteristic of the industry. Note both horizontal and vertical vanes on each grille to assure adequate distribution of air stream. Story on page 15.

Published Monthly by NICKERSON & COLLINS CO.

General Offices: 433 N. Waller Ave., Chicago 44, Ill. Telephones: AUstin 7-1303-04-05

H. T. McDERMOTT, EDITOR AND PUBLISHER — E. R. CURRY, MANAGING EDITOR — J. R. KELAHAN, TECHNICAL EDITOR — H. D. BUSBY, ASSOCIATE EDITOR

ADVERTISING—O. RHODIUS ELOFSON, DIRECTOR — EDW. DAVIESON, Advertising Representative

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INDUSTRIAL REFRIGERATION, Vol. 125, No. 5. Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U. S., $2.00 per year; other countries, $3.00. Single copies, 25 cents. Copyrighted 1953 by Nickerson & Collins Co. Acceptance under Section 34.64 P. L. & R. authorized.

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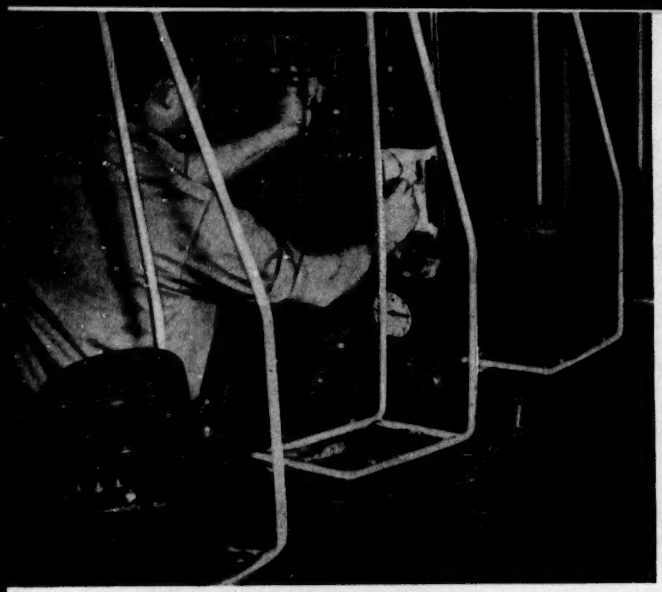
Industrial Refrigeration is indexed regularly by Engineering Index, Inc., and is microfilmed for library use by University Microfilms.



OVER 200 MAJOR MANUFACTURERS of refrigeration and air-conditioning equipment use Tecumseh Compressors. All Tecumseh units are lubricated with Suniso—more than 10 million since 1935. The 2 cylinder compressors shown here are being charged with Freon 12 and Suniso.

THE PURITY OF SUNISO is protected from storage tank to charging board. Here, just prior to charging, the oil is treated to eliminate any gases or moisture possibly picked up in storage. This operation is typical of precautions taken to assure the top protection Suniso can provide.

ALL TECUMSEH UNITS—OVER 10 MILLION OF THEM—HAVE BEEN SUNISO CHARGED

Tecumseh Products Company, of Michigan, is the world's largest manufacturer of refrigeration compressors. The reputation its products enjoy for long, troublefree service is unexcelled. One reason is that all bearings are superfinished by diamond boring, Bearing-izing and Micromatic honing. Limits of a few ten-thousandths of an inch are held on all bearing parts. Another reason: ever since its formation in 1935, Tecumseh has charged its compressors with Suniso Refrigeration Oil exclusively.

Today well over 10 million Suniso-charged Tecumseh Compressors are in service. They range in size from a 1/9 hp hermetic to a 15 hp conventional. Current production is geared to approximately 2¼ million hermetic units a year. Their entire production of both types of compressors will be protected by Suniso.

Most equipment manufacturers throughout the industry specify and use Suniso. Use this "Job Proved" product yourself, and reduce your service calls.

DEPARTMENT IR-12
SUN OIL COMPANY, Philadelphia 3, Pa.

Please send the booklet "Lubrication of Refrigeration and Air-Conditioning Equipment."

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

TECHNICAL ASSISTANCE AVAILABLE. Sun's engineers are at your service for consultation on lubrication matters. It will pay you to utilize the experience thay have gained in solving a wide variety of problems in many different industries.

AS LITTLE AS ONE DROP OF WATER can freeze and clog up a refrigeration system. To make sure they are as free of moisture as the oil, the compressors are kept in drying ovens at 270 to 290 F for at least 8 hours before charging.

SUNISO REFRIGERATION OILS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

SUNOCO

Circle No. 16 on Reader Service Card

What's New

MACHINERY
APPLIANCES • PROCESSES

For your convenience in securing additional information on any product desired, use the convenient Reader Inquiry Card.

Refrigerated Vendor Also Dispenses Music

A REFRIGERATED vending machine that speaks or sings has been developed by Barth Engineering and Manufacturing Co., Milldale, Conn. Called the Video Vendor, the unit is completely automatic in operation and will dispense ice cream, frozen foods, dairy products, or anything else requiring temperature control. Up to six varieties of products

This video vendor sells refrigerated products, also "speaks" and dispenses music.

can be handled and samples are displayed in the front portion of the unit.

Incorporation of an electronic recorder permits the unit to "speak" or play music. Everything from a sales message to a symphony can be reproduced.

The Video Vendor also features an automatic coin changer and a device which makes the dispenser slug and jackpot proof.

For additional information, Circle No. 56 on Reader Inquiry Card.

Citrus in Foil-Lined Cartons

IN cooperation with Sunkist Growers, Inc., Reynolds Metals Company has been conducting studies on the use of aluminum-foil-lined cartons for the storage of fresh citrus fruits. According to recent announcement, storage and handling over periods of 30 to 60 days are possible without ventilation of cartons and without concern about temperature. Successful shipping tests are reported for Arizona and California grapefruit and the studies indicate that Valencia orange and lemons can be protected by this method of packing. Apparently, wide variation in temperature (33 to 80 F) has no deleterious effect.

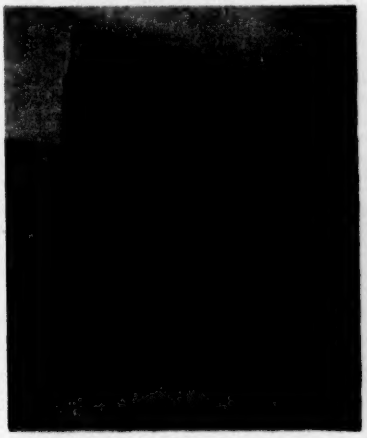
For additional information, circle 72 on Reader Inquiry card.

New Loading Dock Shelter

A LOADING dock shelter to be used when no loading dock is available has been introduced by Atlas Industries Inc. Chicago, Ill. The model is mounted on a concrete abutment and provides complete protection to men and materials when unloading from a box car into a truck or vice versa.

Atlas designed the shelter for efficient, assembly-line production which would still permit "individual engineering" to fit specific conditions of installation.

This model is a combination of standard Scissor and Outrigger dock shelters. The Scissor part extends into the box car where it is fastened securely. The Outrigger fits snugly around the truck. The result is a complete "seal" from inclement weather. When not in use, the shelter folds neatly together, out of the way of traffic.



New Atlas loading dock shelter.

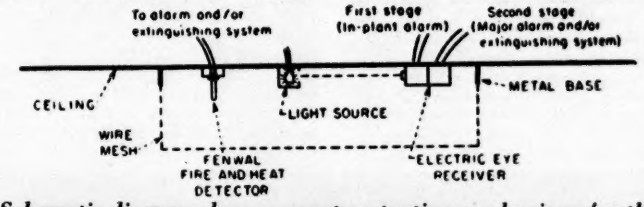
For additional information, circle 65 on Reader Inquiry card.

Fire Protection Unit and Smoke Detector

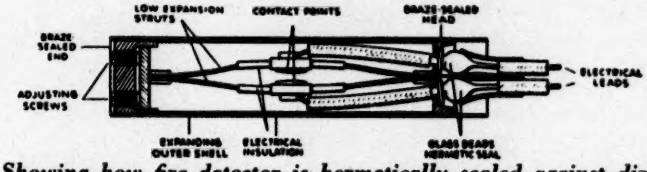
A NEW fire protection unit with a two-stage smoke detector plus an independent fire or overheat detector has been developed by the Cardex Corp., Chicago, Ill.

The smoke detecting unit consists of a light source and an electric-eye receiver. It operates when receiver detects a drop in light intensity, showing the presence of smoke. Depending upon the amount of light absorbed, the receiver triggers one of its two stages. The first stage, responding to a relatively low smoke density, usually sets off a local plant alarm. Second stage operates at higher smoke density, sets of a major alarm or extinguishing system.

The second fire detector unit responds to heat. Known as a "Detect-A-Fire", made by Fenwal Inc., it operates on an entirely independent circuit to an alarm or extinguishing system, providing response if a relatively smokeless fire occurs. This detector uses differential expansion of metals to produce an effect known as "rate compensation." Detection is claimed to function consistently at its pre-set operating temperature regardless of the rate of rise in temperature of the surrounding medium. It operates when surrounding temperature reaches a point that can be set anywhere from 140 to 725 F according to degree of protection desired.



Schematic diagram shows separate actuating mechanisms for the system's independent smoke and heat detection circuits.



Showing how fire detector is hermetically sealed against dirt. Outer shell expands on temperature rise closing switch contacts.

For additional information circle 66 on Reader Inquiry Card.

New Equipment—Continued

M-H Designs Electronic Temperature Controller

A NEW electronic temperature controller with increased range, from —100 F to +600 F, has been introduced by the Industrial Division of Minneapolis-Honeywell Regulator Company for industrial applications requiring precise and consistent temperature control but not requiring the functions of indicating or recording.

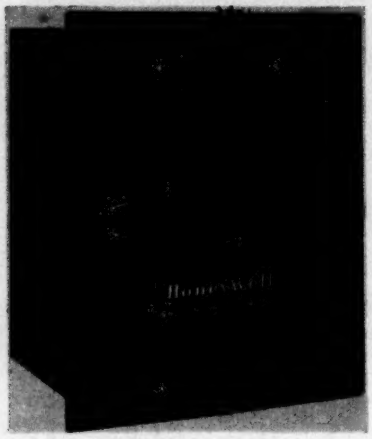


Fig. 1—Exterior front view of new electronic temperature controller introduced by Minneapolis Honeywell.

The new controller (called the New 077), which employs the resistance thermometer principle, is unusually flexible in the type of control provided with a single-point model. For example, the control method may be on-off, two-position, floating or proportioning; the motor or final control element determines the type of control used. The control adjustments are accessible for easy resetting. A pair of red and green signal lights is another feature of the new controller. The green light glows when the temperature at the bulb is below the set point, the red light when the temperature is above set point. This gives a broad indication of where the variable is, for when both lights are out, the variable is at the set point.

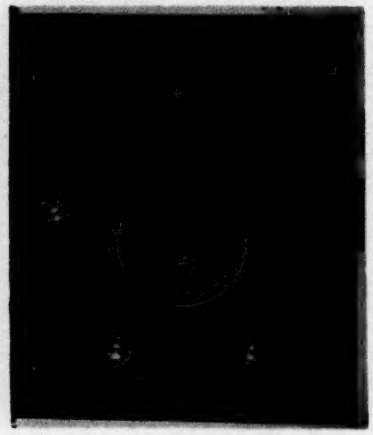


Fig. 2—The new 077 electronic temperature controller with door open, showing sub-panel.

In addition to the single-point model, the new controller is also available in cascade control models utilizing two bulbs. The effect of the secondary bulb in this model may be changed relative to the primary one. Both the single point model and the cascade model are available in three ranges: —20 to 220 F; —20 to 300 F, and —100 to 600 F. Sensitivity for the first two ranges is +0.1 F, and for the third range +0.9 F.

The flexibility provided by the different modes of control available are expected to make the new controller applicable to a variety of industrial uses including heating applications in the food industry, the metals industry, the textile industry, for research activities and wherever precise temperature control is mandatory.

For additional information, circle 68 on Reader Inquiry card.

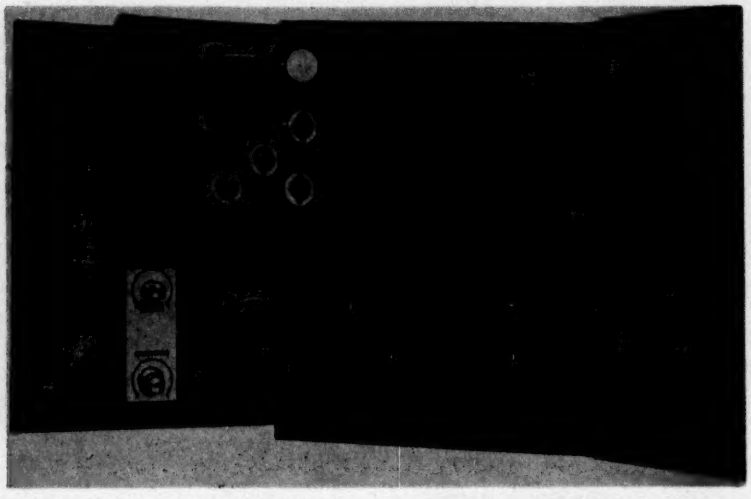
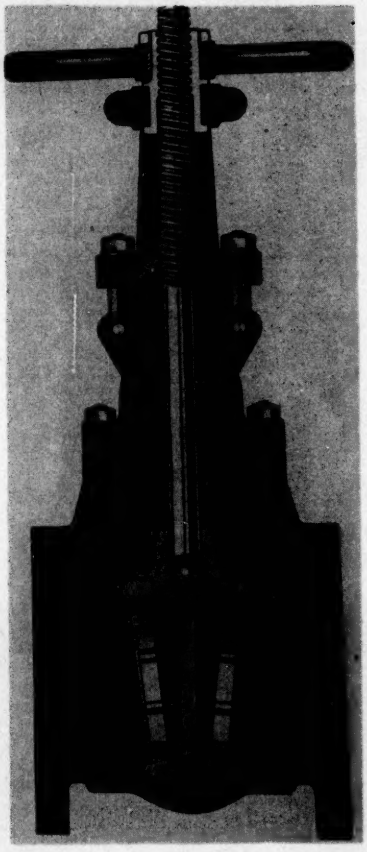


Fig. 3—Sub-panel of M H electronic temperature controller swung out to show adjustments on back.

New Nickel Iron Gate Valve

A NEW 125 lb. iron gate valve, designed for mildly corrosive service in the process industries, has been announced by The Lunkenheimer Co. of Cincinnati, Ohio. The cast iron body and bonnet of the new valve contain 3 per cent nickel, giving it an extra margin of corrosion-resistance over ordinary cast iron in many services. The trim, where corrosion usually does the greatest damage, is made of the most corrosion-resistant alloys used for valves. A choice of trim materials is offered, either 18-8 Mo stainless steel or all-monel.



Sectional view of nickel iron body gate valve, designed by Lunkenheimer Company.

The valve is priced considerably lower than either all-stainless or all-monel valves, and lower than Lunkenheimer causul metal valves which handle more severe corrosive conditions and has been widely used in many applications. It is designed to give economical service on mildly corrosive installations in many chemical processing industries.

For additional information, circle 63 on Reader Inquiry Card.

New Equipment—Continued

New Way to Jacket Fittings

A SIMPLE and relatively easy way has been found to employ welding fittings for directional changes in jacketed piping systems. The fabrication procedure was developed by the Engineering Service Division of Tube Turns, Inc., Louisville, Ky. The jacketed fitting combination consists of long and short radius 90 deg. Tube-Turn elbows, with their center line radii closely matching. On one end of the inside elbow is a tangent that extends beyond the corresponding end of the outside elbow. On the other end of the inside elbow a short piece of pipe is attached to facilitate the installation work. The welding sequence, shown in the accompanying drawing, must be followed exactly.

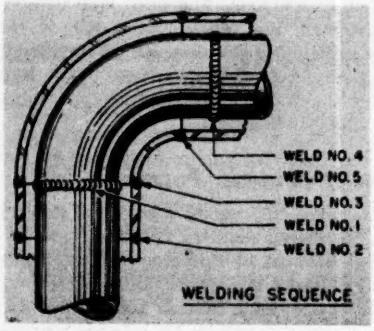


Diagram shows welding sequence in new method of fabricating jacketed fittings.

This type of jacketed fitting, it is claimed, offers important technical advantages and lowers fabrication costs. Specifically, it claims to:

1. Eliminates the need for steam or coolant jumpers.
2. Eliminates flanged joints, except where piping must be disassembled.
3. Permits more accurate temperature control, since there are no concentrations of metals to cause overheating or undercooling, as when flanges are used.
4. Minimizes thermal expansion and contraction problems.
5. Provides optimum flow conditions, since the piping is streamlined.
6. Permits insulation to be readily and permanently applied.
7. Sharply reduces maintenance costs.

For additional information, circle 69 on Reader Inquiry card.

New Odorless Paint

RELATIVE freedom from odor contamination when repainting interiors of food processing plants is now possible with the introduction by Du Pont of odorless enamels, in gloss and semi-gloss, as well as flat.

Since some foods are more susceptible than others in picking up odors, and since odorless paints do have a slight residual odor from the oxidation of oils in the advanced drying stage, Du Pont recommends a simple test prior to painting:

Take a wooden box or paper carton, cut holes in the sides to permit ventilation comparable to that in the room being painted, paint the interior of the box with the finishes to be used and place upside down over a sample of the food being sold or processed. Let the sample remain until paint has dried and if no contamination results, it is reasonably safe to proceed.

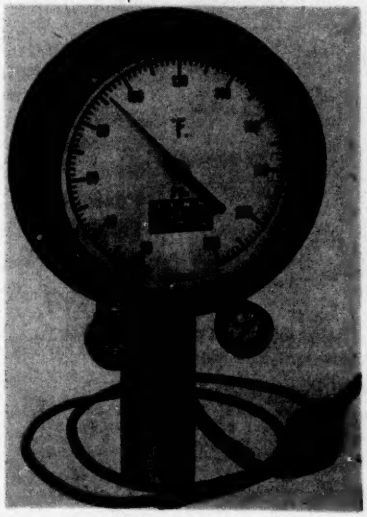
If a plant is air-conditioned, this should be carefully considered as the system will transfer any odors prevailing in one department to other areas.

For additional information, circle 60 on Reader Inquiry Card.

Indicating Temperature Pneumatic Transmitter

A NEW indicating temperature transmitter is announced by Penn Industrial Instrument Corporation. A high grade dial thermometer has been combined with the Penn pneumatic transmitter. The combined unit, suitable for outdoor unprotected installation, may be mounted on 2 in. pipe, wall bracket or panel.

The dial thermometer utilizes a mercury filled thermal system for temperature ranges from —40 to 1000 F and provides an evenly graduated 8 inch diameter scale. A wide variety of bulbs and sockets can be furnished. The standard air output range of the pneumatic transmitter is 3 to 15 PSIG. (Other ranges are available.)



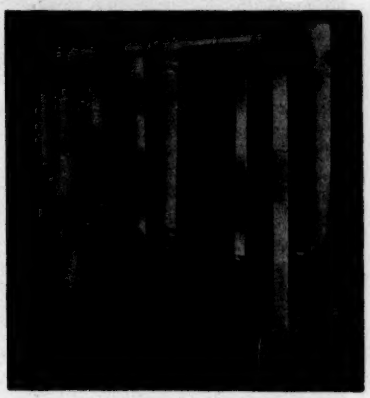
New Penn indicating temperature transmitter.

The instrument is claimed to be particularly convenient since it combines in one compact assembly, both the transmitting and indicating functions; thus eliminating the need for long lengths of capillary tubing or additional indicators. Any number of receivers can be operated by a single transmitter which makes it possible to indicate, record, or control temperatures simultaneously at several different locations in a plant.

For additional information, circle 73 on Reader Inquiry card.

Stainless Steel Plate Heat Exchangers

A NEW advanced line of stainless steel plate heat exchangers has been announced by The Creamery Package Mfg. Company of Chicago. Known as the CP "Crescent," the new units embody improved features to reduce maintenance requirements.



New CP stainless steel plate heat exchanger.

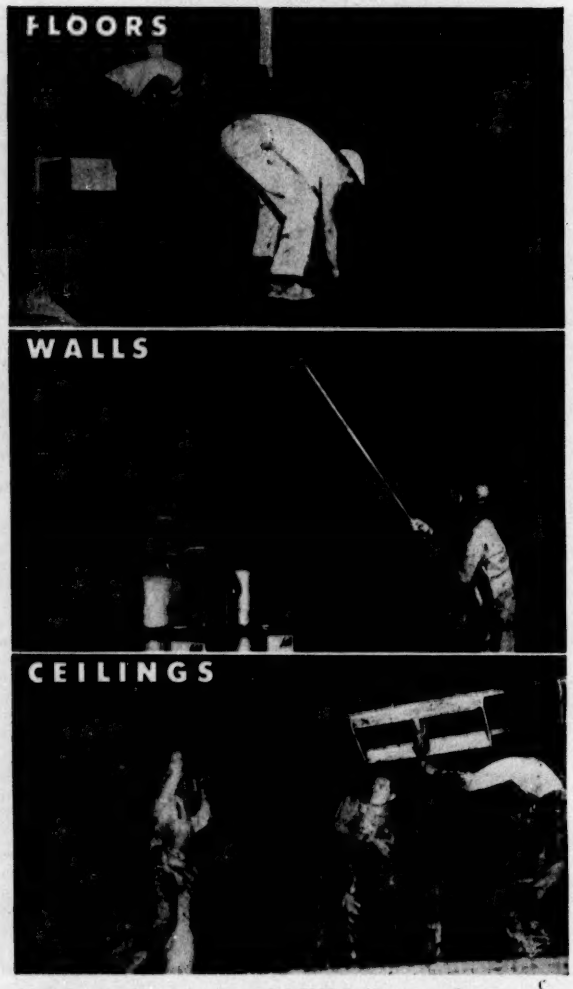
In the "Crescent," more heat exchange surface is obtained from fewer plates and the number of gaskets, one of the principal sources of maintenance in plate heat exchangers, is cut in half. This is possible because every plate is an effective heat exchanger, but only every second plate is gasketed. Gaskets are of "CP Uni-Mold," integral type specially developed by Creamery Package. They are molded, formed, vulcanized and bonded directly to the flat outer rim of the plate. Elimination of gasket grooves in the plates enables fast, thorough cleaning and helps to increase gasket life. The one-piece gasket is so designed that separate port gaskets are not needed. The gasketing material resists absorption of fat and water and the action of heat, pressure and cleaning solutions.

The new heavy duty streamlined press of the CP "Crescent" has a heavy, steel all-welded inner wall, armored with an outer wall of all-welded stainless steel that eliminates permanently all need for painting. A single center push-up that applies equal thrust over the entire plate area and gasket seal makes press lock-up easy and helps to prolong gasket life.

Flow rates are from 5000 lbs. to 150,000 lbs. per hour, depending upon the product, range and application. Hot water or exhaust steam can be used for heating, and chilled water or brine for cooling. The "Crescent" is designed to handle practically any free-flowing product, including milk, evaporated milk, ice cream and other dairy products.

For additional information, circle 71 on Reader Inquiry card.

Specify Laykold®
ASPHALT BASE
for cold insulation construction



These easy-to-use LAYKOLD products are applied cold, with spray, brush or trowel

- **LAYKOLD INSULATION ADHESIVE,** for vapor barriers and for holding all types of insulating materials.
- **LAYKOLD CEMENT,** a special product for holding rigid-type insulation on masonry or concrete surfaces.
- **LAYKOLD WEATHERCOAT,** for protection of exposed insulated surfaces.

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Circle No. 19 on Reader Service Card

PRESS BRIEFS

Frozen Food Prospects

GROWING population and the probability that real income will remain at a high level augurs well for the frozen-food industry, Arden Crawford, of the Market Research Corp., said at a meeting of the Eastern Frosted Foods Association, New York. Mr. Crawford said an increasing number of families was buying frozen foods and they were buying them in larger quantities.

He also pointed out that frozen food facilities were increasing. The Eastern region, in which the group is located is a particularly important market for frosted products, the speaker said. He cited figures showing that this small geographical area, in which about one-quarter of the nation's population lives, accounts for about one-third of all sales.

William H. Kearns, chairman of the executive committee of Ted Bates & Co. said that while the convenience, quality and value of frozen foods had been well demonstrated to the customer, the nutritional value of the products had been sufficiently stressed. He recommended that results of scientific research on frozen foods, now being sponsored by the National Association of Frozen Food Packers, be widely publicized.

Turkey Frozen in Cut-up Form

IN ONE of his recent regular-feature pages of Poultry Processing and Marketing (called "Your Research Reporter"), Dr. George Stewart of University of California comments on turkey steaks and other forms of cut-up turkey, pointing out that holding time in both chilled and frozen condition is likely to be short for several reasons. Turkey fat rancidifies rather rapidly and would tend to set a limit at subzero of about 2.5 months. Longer storage might be possible with fat excluded but lean turkey steaks seem to lack traditional turkey flavor. Shelf life of all dressed poultry is affected by initial bacterial load, which is related to sanitary practice. Thus storage life of cut-up turkey may vary with success of the processor and data on storageability from researches may be applicable only to products handled with maximum care.—TRRF Information Bulletin.

Perishable Foods Lead In Food Store Sales

PERISHABLE foods account for 69.9 percent of the business done by food stores, according to Tips and Topics issued by the U. S. Department of Agriculture. The breakdown of the typical food dollar is: Meat, 26 percent; fresh fruits and vegetables, 12.4 percent; dairy, 19 percent; poultry and eggs, 11.3 percent; frozen foods, 1.2 percent; bakery and cereals, 14.2 percent; canned fruit 2.4 percent, canned vegetables, 4.4 percent; dried foods, 0.8 percent; fats and oils, 4.1 percent; miscellaneous, 4.2 percent.—Cold Facts.

Frozen Food Plant in Sweden

A REFRIGERATING plant, one of the world's most modern, has been opened by Helsingborgs Fryshus A/B near Stockholm, Sweden. The plant has a storage capacity of 6,000 tons and soon will be doubled in size. Fifty tons of vegetables and meat can be frozen in 24 hours. A research and information center for the deep freeze industry has been established by Swedish firms in cooperation with the Academy of Engineering Sciences.

Heat Pump Installation In Tacoma Building

THE first public building in Washington State to employ the heat pump method is Tacoma's big new public utilities building now nearing completion in the center of the city at a cost of $2,600,000. Of reinforced concrete construction, the ultra modern, four-story administration building will have 133,350 square feet of floor space, including a partial fifth floor which will provide for centralizing dispatching operations.

Tacoma is very fortunate in possessing unlimited sources of underground water supplies from water wells which may be found at most any point in the city. In this case, three wells were drilled directly alongside the new utility building and the abundant flow of water from wells will supply both the heat and cold for operating the air conditioning system in the new building by what is popularly called the reverse refrigeration process. Officials chose this unusual method largely because water wells offered a cheap and abundant source of cooling the huge new building in the summertime.

Russia Increases Refrigerator Production

THE Soviet Union's goals for electric refrigerator production during the next several years have been sharply increased. But total output will still be extremely low by American standards. A decree issued jointly by the USSR's Council of Ministers and the Central Committee of the Communist Party has called for manufacture of 207,000 home refrigerators in 1954 and 330,000 in 1955. Output this year is to be about 62,000.

Until now, specific figures on Russian refrigerator production had never been released by the Soviet Union—only alleged percentage gains from an undisclosed base figure. The new policy of releasing specific data is in line with Premier Malenkov's drive to increase the supply of consumer goods.

To attain the new goals, plants of the Ministry of the Defense Industry and Ministry of the Aviation Industry have been assigned to supplement existing refrigerator manufacturing facilities. In fact, these two ministries have been ordered to produce 200,000 of the 330,000 electric refrigerators scheduled to be built in Russia in 1955.

Russia recently has frankly admitted a severe shortage of refrigeration capacity—industrial as well as home.

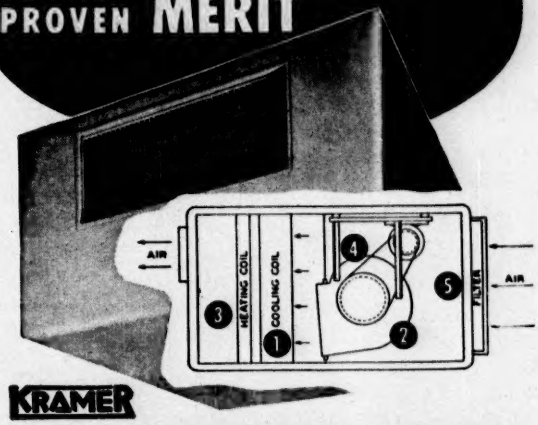
Citrus Company Plans New Precooling Plant

CONSTRUCTION has been started on a $150,000 precooler building to be erected adjacent to the Placentina Mutual Orange Association packing house, Placentia, Fla. The precooling unit will be a two-story structure designed to provide space for precooling fruit and additional space for car and truck loading facilities.

The building, which will measure 70 by 120 feet, will be located on the west side of the packing house along the Santa Fe Railroad tracks with highway connections to Crowther Ave. Space for the scheduled plant was obtained by packing house owners recently when they purchased several small residences in the area and cleared the lots.

The precooling facilities will be made available to avocado growers as well as utilized for packing lemons and oranges. Decision to erect the precooler was made after Placentia Mutual closed a deal to lease a portion of its packing house to the Calvo Growers of California, now moving machinery from its former plant in Vernon.

NEW FEATURES of PROVEN MERIT



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AIR CONDITIONING UNITS

(1) MUGGY-AIR CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

(2) BLOW THROUGH DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in — No motor overload and no loss of bearing lubricant from hot air of the heating coils. No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

(3) ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

(4) QUIET OPERATION

The fans and motor form an integrated assembly, independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

(5) FOR FINISHED INTERIORS

Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

MANY OTHER OUTSTANDING FEATURES.

WRITE FOR BULLETIN AC-238

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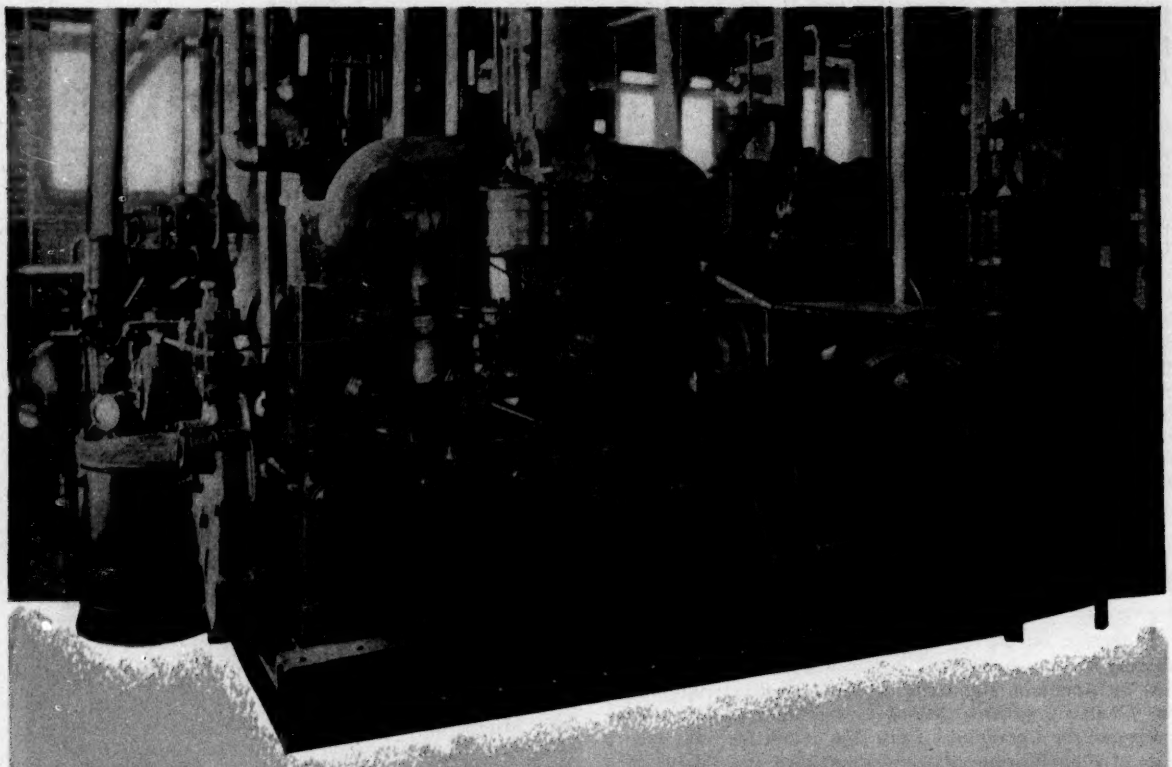

STILL PUTTING OUT LOW-COST POWER AFTER...*how many years would you guess?*

You're looking at a Cat* Sixty Engine in the plant of Williams Bros. Ice and Ice Cream Co., Oklahoma City, Oklahoma. It is approximately 26 years of age. Like a lot of other veteran Caterpillar units, it is still earning its keep with *profitable* performance.

"We bought this engine, used, in 1937," Everett E. Williams says. "We overhauled it and put it in service in the summer of 1938. We have it pulling a 47-HP electric load. It goes in service for the summer run about June 1st each year and is in constant service for about one hundred days. Last summer it was run continuously without stop for 45 days—this was a 24-hour-a-day run."

Records kept over a 10-year span show that parts have been a minor item—less than $250—or about $25 a year. Mr. Williams again: "This engine has given us cheap power at a cost far below anything we anticipated. The most remarkable thing is we can still obtain parts for it."

Today, as years ago, it's Caterpillar policy to build long life into its engines. Naturally, there have been many improvements. Today's rugged yellow Diesels can outwork and outsave the old-timers. They're simple to operate and maintain, use low-cost No. 2 furnace oil without fouling and run with a minimum of down time. And if you need service, you get it *fast* from your Caterpillar Dealer.

He has exactly the right unit for your needs—engines and electric sets in 12 sizes up to 500 HP and 315 KW. Ask him to *show* you how Caterpillar power can pay off in your plant!

Caterpillar, Peoria, Illinois.

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WE'VE MADE CLAIMS... NOW MAKE US PROVE THEM

Circle No. 17 on Reader Service Card

In the Spotlight

THE VACUUM PRECOOLING of vegetables has grown into an important industry during the short period of four years. And new going a step further it is being applied to prepackaged vegetables with successful results. A complete discussion of the subject, with brief historical review is presented in the article starting on page 13.

TEXTILE AIR CONDITIONING offers an opportunity for expanding the use of refrigeration and air conditioning, since atmospheric conditions have an important bearing upon the quality and stability of the finished fabric, also on operating conditions. This subject is given a thorough review by an air conditioning engineer who knows the textile industry. See page 15.

MULTI-STAGING with Rotary Compressors; a paper given by R. B. Holland before the San Francisco Chapter, NAPRE, June presentation the author describes '53 appears on page 21. In this the advantages obtainable to small plant operators by booster compression. The rotary booster compressor is described in detail, and a comparison made with reciprocating machines.

AUTOMATIC CONTROL over cooling water treatment, by J. W. Segraves, describes the application of electronic controls to measure pH values, administer chemicals to counteract acidity or alkilinity, control blowdown, and adjust make up in proper quantities. Tinker Air Force Base installation is described. See page 33.

A PORTABLE ice skating rink was installed in the Milwaukee baseball park while the Braves were not playing at home. Details of the installation are told on page 28.

A MARGARINE factory in Bromborough, England has what is said to be one of the largest refrigeration installations in the country. Costing around $560,000 the plant has a capacity of 1,650 tons and could, as one expert explained, provide an ice cube a day for every man, woman and child in England.

THE NATIONAL ICE Convention in Washington November 17-20 had a surprise visitor in the person of President Eisenhower, who commented briefly and humorously on his experience as an ice man. The theme of the convention was ways and means of "Selling more ice in 1954." In spite of slight drop in tonnage last year the ice men of the nation look forward with optimism toward 1954. Full report of the convention starts on page 37.

THE FLORIDA Association of Ice Industries held its annual convention at Jacksonville, October 13-14. An interesting program was presented and a good time was had by all. Details in story on page 42.

THE FREEZING and storage of bakery products will be the subject of a study to be initiated soon at the Western Regional Research Laboratory. Many problems of bakers, it is hoped, will be relieved by data gained from this study. See page 59.

THE KEEPING quality of carrots in cold storage was the subject of a cooperative study directed from Cornell University. The weak place in storage life appeared to be the period between harvesting and storage at 31-32 F. Other conclusions are listed in the article starting on page 30.

REFLECTING progress and growth of the Association, the forty-fourth annual convention of the National Association Practical Refrigerating Engineers was held at Purdue University November 10-13. Aside from paying honor and respect to Prof. H. G. Venemann, important engineering papers were presented and the usual annual business was transacted. Full report of the meeting starts on page 43.

ENGINEERING papers presented at the forty-fourth annual convention of the National Association Practical Refrigerating Engineers covered a wide range of subjects, illustrating the progress that has been made in engineering thinking. These papers are summarized, starting on page 45.

POTATO GROWERS attending a meeting in Washington with the Secretary of Agriculture and other USDA officials reported a good supply of the best quality potatoes in years had gone into storage.

MODIFIED ICING for shipping potatoes pays off in reduction of spoilage and retaining them in better condition, according to results of research by the United States Department of Agriculture and the California Agricultural Experiment Station. See page 53.

COLD STORAGE HOLDINGS as of October 31 showed a gain in coolers of five points over the previous month's occupancy. Freezer occupancy also showed a gain and had increased to 80 percent. These and other details are given in the summary on page 57.

RUSSIA has produced its first cork in commercial quantities. "Tons" of bark were stripped recently from a grove of cork trees in the Caucasus mountains which was planted 20 years ago. The cork is to be used as insulation for refrigerators.

New

SAVES WATER and CUTS MAINTENANCE COSTS . . .

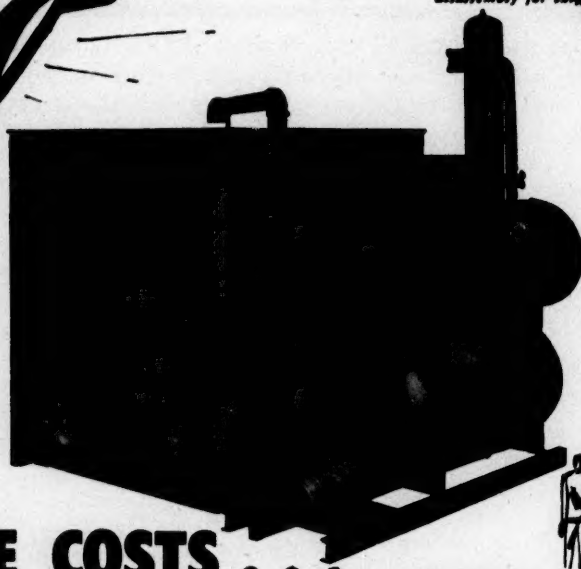
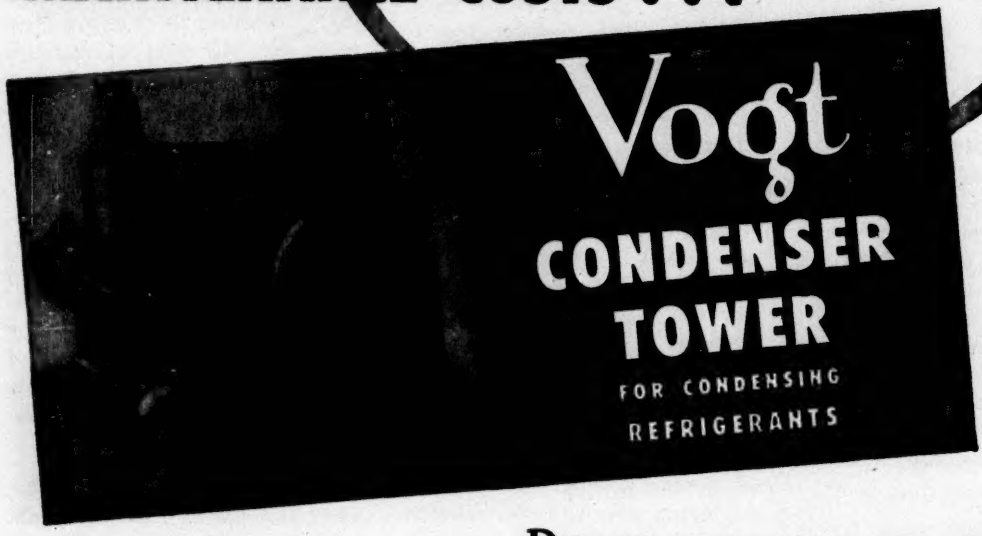


Illustration shows two views of a 55 ton Condenser Tower prior to partial disassembly for shipment.



SINGLE RESPONSIBILITY:

Vogt, leading builder of refrigeration condensers, assumes responsibility for engineering the unit. Only one purchase order needed.

SHOP FITTED:

To cut down field assembly labor. Requires no cutting or fitting of pipe.

Designed for today's water conservation requirements, and to keep refrigeration costs low, the *new* Vogt Condenser Tower meets the need for a proven, readily cleanable condensing unit.

The Vogt Condenser Tower consists of a multipass straight tube condenser, a receiver, an oil trap, a cooling tower, and a water pump. Removable cast iron heads permit easy cleaning of the condenser tubes.

Water costs are extremely low since the cooling water is recirculated continuously and requires only a small amount of makeup to replace losses due to windage and evaporation.

Condenser Tower units are available in capacities ranging from 5 to 50 tons refrigeration. Additional information will be furnished upon request.

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Circle No. 18 on Reader Service Card

VACUUM PRECOOLING VEGETABLES

During the short peroid of four years the vacuum precooling of vegetables has grown into an important industry. This paper presents a review of the important developments to date.

BERNARD A. FRIEDMAN

Plant Pathologist, U. S. Department of Agriculture, Bureau of Plant Industry, Soils, and Agricultural Engineering, New York, New York.

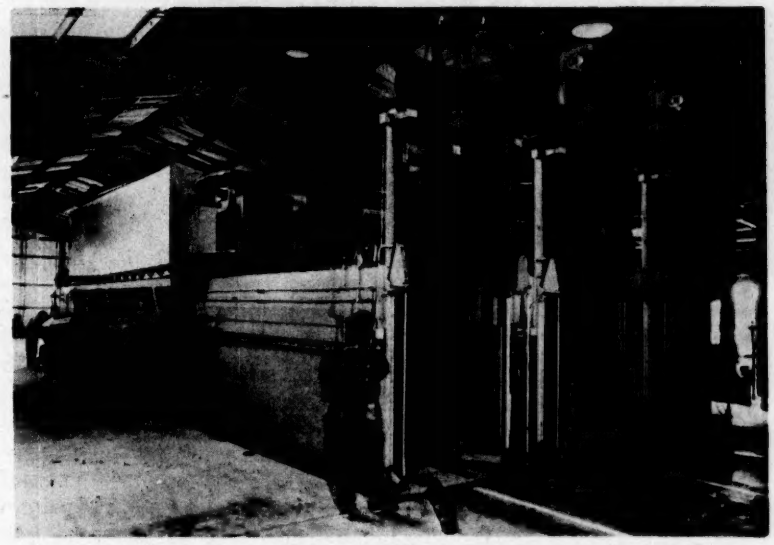
IN 1949 when the speaker had the privilege of reporting at the first annual meeting of the Produce Prepackaging Association on the experimental results of the vacuum cooling of fresh fruits and vegetables this method of precooling was an innovation and there was only one commercial vacuum installation in existance where a small percentage of the lettuce crop of California was being precooled. Results of tests with experimental equipment were reported at that time which indicated prepackaged vegetables, especially the leafy commodities, could be cooled rapidly under vacuum and that the method of vacuum precooling was very promising for use with prepackaged vegetables since these could be precooled after they had been bagged, sealed, and packed in shipping cartons.

More Installations

In the relatively short period of four years, 12 additional vacuum installations which will precool in 1953 about 25 to 30 per cent (the equivalent of more than 15,000 carloads), of the commercial lettuce crop of California and Arizona have been placed in operation. In addition, a large national produce organization installed a commercial vacuum tank in one of its eastern packing plants in 1950 to precool prepackaged vegetables.

It will be recalled that vegetables which are to be cooled by vacuum methods are placed in a steel chamber, the chamber made airtight, and a vacuum created by withdrawing air and water vapor from the tank by pump. The reduction in temperature obtained by the vacuum apparatus is based upon the cooling effect of water vaporization. Water from the surfaces of the vegetables is evaporated and cooled, as the vacuum is drawn. The temperature at which evaporation occurs is determined by the pressure. Thus the normal atmospheric pressure at sea level is equivalent to 760 mm. mercury and water boils (vaporizes) at 212F., but at a pressure (or vacuum) of 4.6 mm., mercury water vaporizes at 32F. By controlling the amount of vacuum produced in the precooling chamber, the amount of cooling to which the produce is subjected may be controlled.

While a vacuum may be drawn by different types of equipment, steam ejectors and rotary pumps are used at present in the commercial apparatus in operation.



A part of the vacuum chilling process—View of empty retorts at one of the Chill-Vac plants, Phoenix, Arizona. In these steel chambers produce is vacuum pre-cooled.

Apparatus

The vacuum installation on the East Coast for the precooling of prepackaged vegetables consists of a steel tank of 182 cubic feet capacity. Air and water vapor are removed from the chamber by means of a multi-stage steam ejector air pump system. The tank has a capacity of 100 fiberboard cartons, each containing 12 ten-ounce perforated cellophane bags of spinach, or 175 cartons, each containing 12 eight-ounce bags of cole slaw or salad mix. The master cartons are non-perforated, partially sealed by brown gummed paper and packed solidly on wooden pallets, without space between the stacks.

Observations and Results

Temperature changes during the vacuum cycle. During the routine operation of this apparatus the temperature of the produce averaged about 65F. when placed in the vacuum tank. After a cycle of 17 to 20 minutes the commodity temperatures ranged from 33 to 41F, with an average about 38F, or an average drop of 27 degrees. It was found that it required about 12 minutes after the pumps were started to reach the desired temperatures of about 33.5F. (equivalent to a partial pressure of 4.9 mm. mercury) at which time there was a spread of about 9 to 11 degrees between the coldest and warmest commodity temperatures.

In one test maintenance of the vacuum at the desired level for 10 minutes reduced the spread in temperature in the load to only slightly over 3 degrees. Accurate control of the amount of vacuum drawn was found to be necessary as commodity temperatures could be reduced rapidly below 32F. inasmuch as the apparatus had a capacity to lower temperatures to about 18F. It was of interest to learn that in this apparatus the coldest commodity temperatures

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Paper presented at third annual Conference and Exposition, Produce Prepackaging Association.

TABLE 1—VACUUM COOLING OF PREPACKAGED PRODUCE

Commodity	Vacuum (mm. of Mercury)	Time (Min.)	Commodity Temperature (°F.) Before Vacuum	After Vacuum
Spinach	4.6–4.9	20	65	34
Lettuce	4.0	10	75	34
Cole slaw	4.6–4.9	18	65	34
Mixed Salad	4.6–4.9	18	65	34
Soup Mix[1]	4.5–5.5	20	62	34
Sweet corn, husked	3.3	10	59	36
Sweet corn, husked	3.8	10	75	39
Celery	4.6–4.9	20	68	42
Celery[1]	4.5–5.5	20	66	47
Tomatoes	4.5	10	73	67

[1]Data from W. R. Barger, U. S. Department of Agriculture, Fresno, California.

were found at the top of the load, while the warmest were located at the bottom.

The results of vacuum-precooling of a number of prepackaged commodities are given in Table I. Results with some other commodities that have been vacuum precooled in bulk and which may be suitable for vacuum precooling when prepackaged are given in Table 2.

Relation of Temperature to Vacuum. It was noted that the temperature at which water vaporizes is determined by the pressure to which it is exposed. The more the pressure is reduced below atmospheric pressure, or stated otherwise, the greater the vacuum, the lower the temperature at which water vaporizes. This principle is illustrated by the results of vacuum precooling of prepackaged spinach at two different pressures (5.0 and 4.5 mm. of mercury) for five minutes. Before vacuum cooling the spinach had a temperature of 80F. Subsequently, the temperature of that cooled at 5.0 mm. was 39F and of that cooled at 4.5 mm. was 32F, showing the greater the vacuum the lower the resultant spinach temperature.

Relation of Ratio of Surface Area of Produce to its Volume. It has been observed that leafy vegetables such as spinach, lettuce, cole slaw, salad mix, and soup mix, all of which are characterized by having a large surface area in proportion to their volume, are precooled very rapidly by vacuum methods. Commodities as corn, asparagus, celery, cauliflower, and mushrooms, which have a somewhat smaller ratio of surface area to volume, are less readily precooled by vacuum. Produce as tomatoes, which have a small ratio of surface area to volume, do not lend themselves to vacuum precooling (see Tables 1 and 2).

Effect of Vacuum Precooling on Quality. The flavor or quality of prepackaged vegetables has not been observed to be impaired in any way by the process of vacuum cooling. Leaf discolorations of lettuce attributed to suffocation during the vacuum process have been shown to have been caused by conditions unrelated to vacuum precooling.

TABLE 2—EFFECT OF VACUUM COOLING IN BULK ON SOME VEGETABLES

Commodity	Vacuum (mm. of Mercury)	Time (Min.)	Commodity Temperature (°F.) Before Vacuum	After Vacuum
Asparagus	3.3	10	64	36
Leek	4.6–4.9	20	68	36–40
Brussels Sprouts	4.6–4.9	20	68	38
Mushrooms	4.6–4.9	20	67	39
Cauliflower	4.6–4.9	20	76	44
Broccoli	4.6–4.9	20	65	45

Because the cooling of produce during vacuum treatment results from the evaporation of water it would seem that considerable water might be lost and the produce wilted. It has been calculated that very little water must be evaporated to cause the cooling effect; and actual measurements have shown that there is very little weight loss and no noticeable wilting of the produce. The percentage of weight loss ranged from 2.0 to 3.2 per cent (See Table 3).

Effect of Refrigeration on Warm Loads of Produce. While refrigeration is generally recognized as the best method to maintain the quality of prepackaged produce, it is apparently not recognized by some that non-precooled prepackaged produce stored in a cold room cools very slowly. For instance, non-precooled cole slaw that was kept for four hours in a cold box held at 39 to 42F. cooled at an average rate of only one and one-half degrees per hour.

Effect of Ice and Vacuum Precooling on Commodity Temperature and Salability. During hot weather it has been found necessary to use water-tight bags containing 4 to 5 pounds of crushed ice in the cartons in order to deliver prepackaged spinach, cole slaw and mixed salad in a salable condition. In tests to determine the effect of ice and vacuum cooling upon commodity temperatures and shelf-life, the coldest temperatures were found in the cartons containing ice bags, with the lowest temperatures and the highest percentage of salable produce in the vacuum-cooled-ice bag combination. Produce which was vacuum-cooled alone warmed up very rapidly, and the refrigeration obtained by this method may be expected to give some protection for only about three hours.

Advantages of Vacuum Precooling of Prepackaged Produce

Efficient Precooling of Packed Crates and Film Packages. The vacuum-cooling process is routinely used at present to precool produce in bags of transparent films that have been packed in master containers or cartons. The precooling is efficient even when the packed cartons are stacked tightly in high piles in the vacuum tank. The rate of cooling of packed produce in a conventional refrigerated storage room is very slow. Precooling of vegetables by cold water has to be done prior to prepackaging and there is a partial loss of refrigeration during the subsequent packaging operation. In addition, it has been estimated that hydrocooling costs almost twice as much as vacuum-cooling.

(Continued on page 59)

TABLE 3—EFFECT OF VACUUM PRECOOLING ON WEIGHT LOSS OF PREPACKAGED VEGETABLES

Commodity	Vacuum (mm. of Mercury)	Time (Min.)	Weight Loss (Per Cent)
Spinach[1]	4.5–5.5	30	3.2
Soup Mix[1]	4.5–5.5	30	2.2
Salad Mix[1]	4.5–5.5	30	3.2
Salad Mix[2]	4.6–4.9	18	2.6
Celery[1]	4.5–5.5	30	2.7
Cole Slaw[2]	4.6–4.9	18	2.0

[1]Data from Barger. [2]Data from Friedman.

TEXTILE AIR CONDITIONING

A discussion of the application of refrigeration and air conditioning in the textile industry. Atmospheric conditions have important bearing upon quality of the finished fibre.

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TEXTILE air conditioning, as covered by this article, relates to the application of refrigeration and air conditioning in the textile industry, specifically with regards to those processes that convert the finished fiber into cloth, rather than those processes incidental to the manufacture of the fiber itself.

Lack of Information

In the past, very little has been written upon this subject even though the basis of all air conditioning revolved around the textile industry. The very term "air conditioning" was coined by an electrical engineer interested in the textile trade, since he was selling automatic humidifiers, and the phrase indicated what he was trying to accomplish. In fact, the term "air conditioning" was used very loosely for nearly twenty years before the American Society of Heating and Ventilating Engineers gave the term its now accepted definition.

Atmospheric Conditions

Atmospheric conditions have been known for centuries to have direct bearing upon the quality of products manufactured in the textile trade. Manchester, England, for many years was considered the "Home of the Textile Industry." However, a very severe drought in that country created hazards with the market. As a result, owners of raw material experimented on their own to see if something couldn't be done to eliminate this control of the trade. Thus mills were developed in the New England area adjacent to bodies of water because of power and favorable atmospheric conditions, where they were able for a larger part of the year to produce an accepted product.

Economics of Industry

The economics of the industry have had a great bearing on its slow growth. Since America has operated on a ten per cent export trade, the cheaper labor outside this country and the resulting lower import prices has been a stumbling block for fast development. The two World Wars, together with scientific and engineering improvements, have changed this situation. One of these improvements, air conditioning in accordance with the ASH&VE definition, has become a functional part of the textile industry.

This paper outlines the tremendous potential for air conditioning and refrigeration in the textile industry and is an attempt to stimulate an interest in the training of maintenance engineers.

One organization at the present time, the Bahnson Co., is attempting to fill this need with maintenance engineers classes held on an annual basis. This falls short of requirements and the ever growing demand for refrigeration technicians who can fulfill the responsibility of keeping this machinery in operation. In many cases air conditioning machinery operates 24 hours per day, 52 weeks in the year, providing as steady a job as can be acquired in this day and age.

Many of the machines installed are from 500 tons up, usually of the centrifugal type. The textile industry experiences a great deal of difficulty in obtaining competent men to take the responsibility for operating these machines correctly, and keeping them in operation to produce air conditions required for high quality products of this trade.

It is true that the systems outlined in this paper could in themselves involve a paper apiece, but it is our hope that there is sufficient information presented to arouse interest and enthusiasm over the problem of textile air conditioning.

Textile Air Conditioning

Essentially textile air conditioning provides:

An improved quality of product: Improved product quality and the close quality control are understandably essential in a business where the market has always been extremely competitive.

Proper atmospheric conditions to process various types of yarns: With all the new synthetic fiber, with the new fabrics using old fibers, with improved sized coatings and in new blends, accurate control of atmospheric conditions is a necessity to the accelerated processing and manufacture.

The optimum ambient conditions for operating personnel: Since the product relies entirely on the operating personnel, it is absolutely essential that the operating conditions should approach current standards of comfort cooling. In many States this has been written into legislation, and must be conformed with at all times.

While it is a fact that refrigeration equipment capable of unlimited capacity has been available for some time, the combination of three factors led to the more extensive use of refrigeration cycle in textile air conditioning:

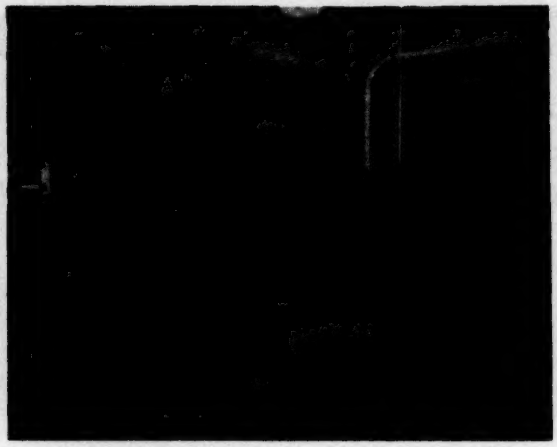
(1) The simultaneous development of specialized high production textile machinery and the compact, efficient, large capacity refrigeration unit, led greatly to the consideration of necessity for application of these refrigeration units in conjunction with this highly specialized production machinery.

(2) The development of special yarn coating has demanded very definite control of the atmospheric conditions in order to be practical in their application.

(3) The development of new synthetic fibers having physical characteristics which require special atmospheric conditions in order to be useful at high production rate, and for high quality results in the finished product, made conditioned air imperative.

Any woven product will incorporate some and often all of the pro-

Air washer for weave room, Carter Fabrics Corp. Worthington pumps, left foreground, circulate 930 gpm chilled water for refrigerating purposes and another 655 gpm water for humidifying air washer. Note 6 inch pot strainer on pump discharge. Access doors at right center permit inspection of air washers. Standby city water supply through 2 inch mains is shown at right. Instrument at extreme right is dew-point control and recorder. Buffalo fan, 40 hp, draws 78,400 cfm at 2 in SP through washer. Washer has concrete water tank foundation.



Centrifugal water chilling unit for weave, compress and quill rooms at nylon plant. Two stage compressor pictured is a 242 ton Worthington, condensing at 93 F with 83 F water. Chilled water is supplied to air cooling coils at 63 F. Condenser water, 710 gpm, is circulated by a Worthington Centrifugal pump at 67 ft. head. Cooling tower serving this system is a C. H. Wheeler, designed for 76 F wet bulb performance. Air compressor shown in right background is an 8 x 7 inch Sullivan, water cooled, delivering 30 psig air to atomizer system.

duction processes listed in table 1, and frequently peculiar subsidiary steps. The optimum dry bulb temperature will be a minimum 80 F and with the smallest allowable upward addition that is economically feasible. Listed in Table 1 are the processes from baled staple or cased filament to the finished cloth showing the desired relative humidities for the four main types of fibers. Cotton being the most common fiber, the names of the processes of the other raw materials have been related to cotton process for simplicity of tabular data.

TABLE 1—PROCESSES, WITH RELATIVE HUMIDITIES FOR MAIN TYPES OF FIBERS

	Cotton	Wool	Staple Synthetics	Filament Synthetics
Opening	50%	50%	50%	
Blending	50	50	50	
Cleaning	50	50	50	
Picking	55	50	55	
Carding	55	50	60	
Lapping	55	50	60	
Combing	55	50	60	
Drawing	55	50	60	
Roving	55	50	60	
Spinning	60	55	65	60%*
Twisting	65	55	65	60
Spooling	65	55	65	60
Winding	65	55	65	60
Warping	65	55	65	60
Slashing	—	—	—	—
Weaving	85	60	75	70
Shearing	65	50	65	60
Inspecting	65	50	65	60
Mending	55	50	65	60
Folding	65	50	65	60
Baling	65	50	65	60

*Throwing

The values shown in Table 1 represent average practice. The weight of the yarn being run, and the purpose for which it is being prepared, has a bearing on the exact conditions selected by mill management.

Types of Systems

It is only logical now that we proceed by sub-dividing the various methods of textile air conditioning into the systems that accomplish the humidification and the control of temperature. To any type of system, winter heating and air cleaning can be added. Refrigeration is added to most of these systems that embody some method of air change to carry a room temperature lower than the cooling ability of the evaporation of water. Basically the types of systems in operation today would follow the list below:

Spot humidifiers
- (a) "High duty" humidifiers
- (b) Centrifugal humidifiers
- (c) Atomizing humidifiers
  - (1) Using compressed air
  - (2) Using both air and water pressure
  - (3) Using steam

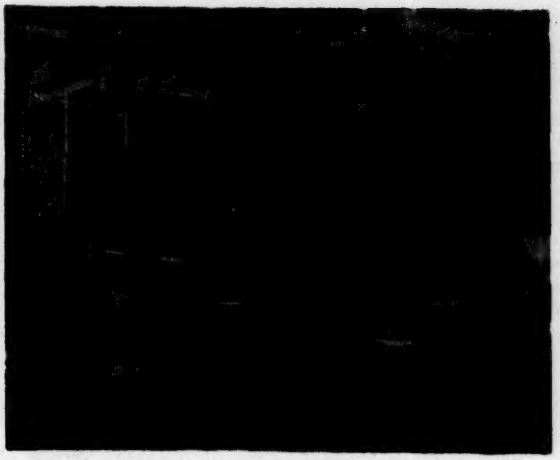
Humidifying and ventilating units
- (a) Dry duct unit
- (b) Wet duct unit

Central system humidifiers
- (a) Straight air system
- (b) Atomizer booster system

Spot Humidifiers

With the invention of the Spinning Jenny, it was soon found that when cotton ran over guiding surfaces, through rolls, or was twisted, it worked much better on damp days. Thus, the moist climate of England was the greatest contributing factor to the development of the textile industry in that country. This same idea was utilized in the development of the New England textile industry, when factories were built adjacent to rivers. The demand for higher speed machines resulting in the higher developed friction, and static electricity conditions, necessitated the adding of greater quantities of moisture to the surrounding air. The first humidifiers were nothing more than sprinkling cans which boys carried around to dampen the floors adjacent to the machinery. This was followed by the use of pipe extended above the machines with holes drilled along the surface and the steam applied to give a jet form of atomization.

At the turn of the century, machinery speed had reached such a point where these makeshifts could no longer produce the required conditions, and shut downs followed when outside atmospheric conditions were not conducive to good production. Two heating and plumbing contractors developed devices for automatically evaporating water. These consisted of very high pressure jets of water impinging upon small tar-



Carding room in Textile plant. Note level of air distribution ducts. Even and adequate flow of properly humidified air is essential to this process.

Air distribution duct in spinning room. Conditioned air for temperature and proper humidity is an essential requirement for quality control of product.

get pins to generate a spray. In the process of development, housing cones and drain pans were added to prevent the liberation of free water.

High-Duty Humidifier

In order to cover greater floor area, a small propeller fan was added to draw air through the spray and force the moisture circulation. These fans were originally driven by pelton wheels from the pressure of the supply water, but this inefficient power was soon displaced by electric motors. This device was called a high-duty humidifier. They are still in use today being quite applicable in storage rooms, not only in textiles but also in the tobacco industry. They evaporate from 60 to 100 pounds of water per hour and require a pumpage of about 1.5 gpm between 160 to 200 psig. The fan is usually ⅛ hp.

Where many humidifiers are installed, a gravity drain system is arranged from the pans so that the excess water is conducted back to a filtering tank. Here a central pump sends it back to the high-duty humidifiers creating a saving in water used. It is the responsibility of the maintenance engineer that each of these units are stopped once every eight hours for cleaning so that high efficiency can be maintained.

Centrifugal Humidifier

The variation of the high-duty humidifier is the centrifugal type wherein the spray is generated by a stream of water striking stationary pins on a grid at the periphery of a rapidly rotating disc. On the same shaft of the disc is a fan which blows the spray away from the disc. The most common type blows the spray horizontally across the room. There is another type which spreads the spray out equally in all directions. One of these units will evaporate up to 100 pounds of water per hour pumping 20 gpm at 60 psig. The fan is usually 1/6 hp.

Atomizing Humidifier

Around 1910 the compressed air atomizer made its appearance. These were mounted on top of an air pipe with a water pipe directly beneath. Air escaping from an orifice aspired water into its escape cone and atomized it fine enough so that it would evaporate into the room air. It was neat, easily installed and maintained, and very efficient. It evaporated up to 15 pounds of water per hour, and required approximately 0.2 cfm of compressed air at 35 pounds per square inch for each pound of water evaporated. These atomizers can be found in quite general use today. Water is usually fed to the head by gravity from a central float tank located strategically around the mill, or occasionally water is supplied under pressure (approximately 25 psig). With this latter system there is an indicated saving of compressed air.

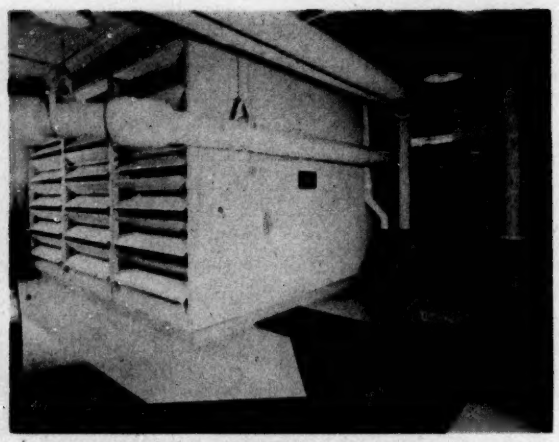
In order to facilitate the maintenance of this equipment, self-cleaning designs were developed; that is, a thrust pin pierces through the orifices whenever the air pressure changes, thus ridding the orifices of any small particles what may adhere to the surface. At various times, devices using steam for the power jet, instead of compressed air have been developed, but none of these have met any wide acceptance.

Humidifying and Ventilating Units

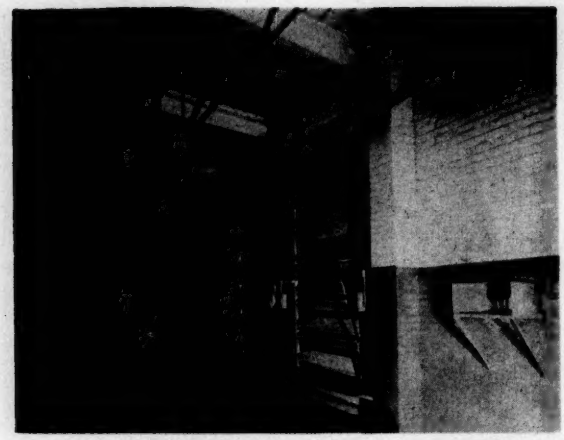
The change of the century saw increased machine speeds and adaptation of electric power, thus increasing heat load and giving rise to demands for a supplement to natural ventilation. Loads often exceed 250 btu's per sq ft of floor space, and room temperatures climb to 120 F during hot weather. These rooms are equipped with monitors or sawtooth roofs to increase natural ventilation.

Since all existing mills were already equipped with means of humidification, the first tentative step was the installation of fans in windows to supply false ventilation. Ventilation by this method brought uncontrolled air currents proving harmful to the processes, and irritating to the operators. In addition, there are no means of varying the outside air quantity to suit the varying loads or climatic changes.

Several companies now make unit window ventilators embodying means of mixing recirculated air with outside air under control of a thermostat and employing a delivery grille to distribute the air. These find limited application principally in narrow rooms of the older plants, and if carefully applied the results are acceptable. They are available in sizes up to 8,000 cfm, and are often combined with blast coils for winter heating. Usually the existing humidifier system has to be modified so that its spray pattern will conform with the air supply and the method of distribution. In many cases, additional humidifiers must be added since the original design was for natural ventilation and have insufficient capacity for the added window ventilators.



Air plenum ahead of washer for throwing room of a textile mill. Return air intake dampers pictured. First Worthington pump on right circulates condensing water to C H Wheeler redwood induced draft cooling tower, from condenser of 460 ton Worthington centrifugal refrigerant compressor. Second pump circulates chilled water.



Opposite, or interior, view of dampers shown at left. Note damper motors, controlled by Johnson Service Co. pneumatic system. Box on masonry wall for mounting element used to control wet bulb temperatures from outside chamber. Outside air intake is through ceiling, and controlled also by pneumatic motors.

Dry Duct Units

In many of the higher powered processes such as spinning and twisting it becomes impractical to introduce enough air by simple window units. Among engineers there is a difference of opinion as to whether window units should be applied to rooms wider than 75 ft, and many even contend that 40 ft is too great a throw. Thus, it is found that the addition of duct work is necessary to convey the air nearer to its objective. This led to the development of a centralized fan, damper and heater units and large amounts of multiple outlet ductwork distributed through the manufacturing area.

The usual practice is a compromise between the simple system and a small window unit. The capacity per unit is determined by space availability and the points where air can be introduced with sufficient clearances for the ductwork and the maximum of allowable blow from one duct to the next. Employing axial-flow fans, differential dampers and possibly heaters, these units are available in sizes up to 40,000 cfm. They are usually referred to as air changing units. Higher speeds must be carefully considered lest their noise be audible over the machinery level. This is usually around 90 decibels.

Wet Duct Units

Combined humidifying and ventilating units are obtained by the installation of a centrifugal humidifier and an air handling unit. The moisture is introduced into the supply air within the unit and carried as both vapor and free moisture through a round duct and discharged through a circular nozzle. The free moisture is evaporated after the air is introduced into the room. This characteristic of being able to introduce entrained moisture into the conditioned space results in a lower apparatus dew-point than room dew-point, eliminating the necessity of booster humidifiers. All excess moisture and possible sweating is collected in the drain trough mounted beneath the duct and the unit.

Central Systems

What are known as central systems today consist primarily of centrifugal type fans, air washers through which all air is passed, consisting of baffles, two sets of spray headers with nozzles, and eliminators, plus heating coils and the necessary outside and return air dampers. This type of installation is readily adaptable to refrigeration and the centralization of maintenance makes their use extremely attractive. However, it must be borne in mind that the equipment rooms are extremely large in size, especially with standard installations of over 200,000 cfm, and some between 300,000 to 400,000 cfm.

It might be mentioned that the air washer had fallen into disrepute as far as cotton mills were concerned due probably to poor engineering since the first designs were very short of air. Early in 1940 after air washers had proved their benefit to the hosiery industry, they were again introduced into cotton mills. With better engineering application, they are now accepted as the tool of trade.

Straight Air Systems

A so called straight air system is one in which the humidification of the room space is accomplished with a vapor in the supply air. Industrial air washers are rated at approximately 96 percent saturation efficiency, which means that the dew-point of air leaving them is very close to the entering wet bulb temperature. The room design relative humidity, and associated type of temperature rise, determines the necessary volume of air from the air washer. In textiles, relative humidities greater than 60 percent are not attempted with a straight air system, except in very light load processes or in applications where free moisture in the air is detrimental to the process.

Atomizer Booster Systems

Cotton weaving usually requires 85 percent relative humidity, and in textile application where required humidity exceeds 60 percent, practical consideration dictates the use of atomizers. These are usually mounted directly over the grilles discharging the air. (See Cover picture.) Thus, the atomizer water penetrates the air stream. In special installations, some piping is installed inside the duct and then the atomizers are mounted directly in the grilles, thus accomplishing the same method of distribution. (See picture of carding room.)

The booster system is extensively

used with installations employing refrigeration. It reduces the quantities of air handled and is often referred to as the split system. The primary advantage of this arrangement is the simple method of quick, positive relative humidity control.

Evaporative Cooling

Unit and central systems employing no refrigeration are referred to as evaporative cooling systems. On either of these types the inside dry bulb temperature is dependent entirely upon the outside wet bulb temperature. All engineers know there is no direct way to answer the question as to how much cooler it will be inside than outside with this type of system. But a precise accurate answer in terms of hours of duration of inside temperatures can be given for the entire summer.

As it is commonly known, the inside temperature will always be a definite number of degrees above the existing outside wet bulb temperature. This rise in temperature is generally stated in the proposal or the engineer's specifications. However, accurate information about prevailing wet bulb temperature is not widely disseminated. For that reason, the accompanying table (Table 2) is given showing the number of hours of occurrance of all wet bulb temperatures over 70 F during the five summer months.

These hourly readings were taken at Columbia, S. C., because this city represents about the average climatic

TABLE 2—TOTAL HOURS OF OCCURRENCE OF WET BULBS OF 70 F OR OVER FOR MAY, JUNE, JULY, AUGUST, AND SEPTEMBER

70° Wet Bulb		71° Wet Bulb		72° Wet Bulb		73° Wet Bulb		74° Wet Bulb		75° Wet Bulb	
No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb
8	70	12	71	16	72	16	73	15	74	4	75
24	71	42	72	39	73	39	74	26	75	26	76
23	72	23	73	29	74	57	75	35	76	15	77
24	73	27	74	20	75	27	76	17	77	27	78
19	74	20	75	14	76	18	77	19	78	12	79
10	75	17	76	13	77	16	78	12	79	14	80
12	76	7	77	19	78	5	79	14	80	8	81
9	77	5	78	12	79	10	80	6	81	10	82
5	78	6	79	5	80	8	81	12	82	12	83
4	79	9	80	8	81	11	82	14	83	10	84
4	80	6	81	6	82	9	83	8	84	12	85
6	81	3	82	11	83	10	84	10	85	7	86
5	82	7	83	5	84	7	85	9	86	6	87
3	83	8	84	7	85	4	86	7	87	10	88
6	84	3	85	2	86	3	87	14	88	12	89
8	85	8	86	6	87	6	88	9	89	8	90
8	86	4	87	9	88	8	89	8	90	7	91
2	87	4	88	5	89	5	90	6	91	8	92
4	88	4	89	6	90	5	91	4	92	9	93
9	89	5	90	3	91	4	92	5	93	7	94
1	90	4	91	2	92	5	93	1	94	3	95
2	92	2	92	2	94	2	94	5	95	5	96
1	93	1	93	1	94	2	95	1	97	3	102
1	94	3	94	1	97	1	96	1	99	1	103
3	95										
2	96										
1	97										
204 Total Hrs. 5.6% of Period		230 Total Hrs. 6.3% of Period		241 Total Hrs. 6.6% of Period		278 Total Hrs. 7.6% of Period		258 Total Hrs. 7.1% of Period		236 Total Hrs. 6.5% of Period	

76° Wet Bulb		77° Wet Bulb		78° Wet Bulb		79° Wet Bulb		80° Wet Bulb		81° Wet Bulb	
No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb	No. Hrs.	Dry Bulb
6	76	2	77	3	82	3	81	3	90	1	85
7	77	3	78	4	83	2	82	2	92	2	86
8	78	3	79	3	84	1	83	3	93	1	93
9	79	13	80	1	85	2	84	1	94	1	94
9	80	6	81	7	86	1	86	1	95	1	99
11	81	6	82	5	87	2	87	4	96	6 Total Hrs. 16% of Period	
12	82	9	83	6	88	5	88	1	102		
6	83	7	84	3	89	3	89				
5	84	7	85	3	90	2	90				
13	85	11	86	7	91	2	91				
9	86	9	87	5	92	2	92				
9	87	8	88	9	93	2	93				
9	88	8	89	1	94	1	94				
12	89	11	90	6	95	2	95				
7	90	5	91	5	96	2	96				
7	91	6	92	2	97	4	97				
6	92	4	93	1	98	4	98				
5	93	8	94	2	99	3	99				
4	94	6	95	4	100	1	101				
4	95	2	97	1	102	1	102				
7	96	2	98							82° Net Bulb	
4	97	1	99							No Hrs.	Dry Bulb
3	99	1	100							1	89
1	100									1	91
1	101									2	92
										1	96
174 Total Hrs. 4.8% of Period		138 Total Hrs. 3.8% of Period		78 Total Hrs. 2.1% of Period		45 Total Hrs. 1.2% of Period		15 Total Hrs. .4% of Period		5 Total Hrs. .14% of Period	

NOTE: Total hours for period is 3648; 70 W.B. or over occurs for 1908 hours, or 52 percent of period.

conditions for the textile South. For other localities the distance can be postulated. Thus, for Knoxville, Lynchburg, and Asheville 1 degree F is subtracted, while for Richmond, Raleigh, Macon, Columbus, Montgomery, and Birmingham 2 F is added. The year selected as about average, and in this chart, 1940.

Using this table, it is easy to add the design difference between the inside dry bulb temperature and the outside wet bulb temperature, to the outside wet bulb temperature and to determine with reasonable accuracy the number of hours of each temperature to be expected from an evaporative cooling system. The inside dry bulb temperature will always equal outdoor wet bulb temperature plus this difference. The design differences between outdoor dry bulb temperatures and outdoor wet bulb temperatures for various relative humidities might be as follows:

50%	55%	60%	65%	70%	75%	80%	85%
19°	17°	15°	13°	12°	11°	9°	8°

It is easily noted that the rise shown for 60 percent relative humidity is about the maximum allowable dry bulb temperature, and that relative humidities below 60 percent depending upon the processes. If more comfortable working conditions are required, refrigeration is necessary.

The dry bulb temperatures occurring with each wet bulb temperature are given in the table because the frequent incident of high wet bulb temperatures for the relatively low dry bulb temperature is not generally appreciated. This is a so called "dog day weather" when the mill maintenance personnel will be deluged with complaints that there is something wrong with the system. Fortunately these weather conditions generally do not last for long periods of time for they breed their own remedy, that is, storms.

Heating

In the textile south, heating is a peculiar problem. Even in the coldest weather, a spinning room in operation will require considerable quantities of outside air to keep the temperature down to 80F. The mass of machinery is so great that a reasonably tight spinning room will cool off very little during the week-end shutdown period. However, considering the traditional feast or famine tendency of the industry, it is usually felt that it is worthwhile to install some method of heating, since there is a possibility of long shutdown periods. For the sake of efficiency, the temperatures are designed for 75 F dry bulb temperature.

In many of the old mills at the present time, transfer of heat is accomplished at the ceiling adjacent to the outside wall, usually consisting of 4 to 8-1¼ inch ips steel pipes on roller hangers, possibly 200 feet in length. This arrangement has very little maintenance problem and requires very little cleaning; however, it is very difficult to control and does achieve very poor distribution. At the present time, the first cost is higher than any other method.

The general practice where forced ventilation is employed, is to use blast heater coils either in the fan room or in the zone duct, whichever the control design dictates. This is a very easy installation and very inexpensive method of heating. These heaters are no different from any other air conditioning installation.

Refrigeration

Old mills operating with new synthetics, or a combination of staples and synthetics, require refrigeration as an integral part of their air conditioning installation. Few cotton mills have yet added full refrigeration, but they have it in many of their processes; such as, carding, roving, twisting, spinning, winding, and warping. Cloth rooms for inspection, with their high occupancy and light machinery load, and high efficiency standing, would seem to almost require refrigeration, but surprisingly few of these areas have been done.

Air conditioning of weave rooms have never been attempted; however, there are experimentations at the present time to operate weave rooms at 65 percent relative humidity. If this proves to be successful, and the experiments have that indication, then it will require full refrigeration for the cotton mill. This new condition for weaving is producing a much cleaner room and a higher quality product. Modern full fashion knitting machinery requires air conditioning as a production tool. The variation of more than 2 F from the required 80 F will often result in seconds and broken needles.

Almost all refrigeration in textile air conditioning is accomplished with central chilled water systems, water being piped through the mill to the various units on multiple unit jobs, or to the central air handling unit on the central station job. However, on certain small isolated processes, the use of direct expansion units with direct expansion extended surface coils has been encountered.

Air Cleaning

Dirt, which can be defined in this case as material out of place, is detrimental to any process; therefore, all types of air cleaning medias designed today are being used in one form or another throughout the textile industry. Electrostatic filters, the paper type, and the viscous type are being used to control dirt particles entering from the outside atmosphere. Screens of various types are being used to collect lint from the manufacturing area. In central station systems that the air washer itself is an excellent air cleaning piece of equipment. Very careful consideration should be given to the design of the media to be used in conjunction with the textile process or operation with which it will be used.

Air Distribution

Air distribution constitutes a very serious problem as far as the textile industry is concerned, since with present machinery design you have concentrated high heat loads and long machines. Uniform air conditions are required across the entire length of these machines. Further, air velocities must be kept down to an absolute minimum, so that there is no possibility of crossing the threads, creating breakages. For example, nylon filaments are so gossamar that they will tangle in an air motion of more than 15 feet per minute. When consideration of the fact that a single machine is 60 feet long, and it cannot stand a variation of more than 2 F dry bulb temperature, the seriousness of this problem will be realized. Therefore, it is quite common in the average mill today to find both types of grilles for horizontal and vertical motion placed together (See cover picture and picture of spinning room) and the various types of circular diffusers designed for no drafts. The solution to the problem can be solved only by using the utmost caution in placing the duct, and selecting the correct type grille or diffuser.

Southwestern Chapter NARW

AT A meeting of the Southwestern Chapter of the National Association of Refrigerated Warehouses at the Western Hills Hotel in Fort Worth, October 31, Shefield A. Kadane, president of the Pure Ice and Storage Company, Dallas, Texas, was elected chairman. Discussion of business problems in the warehousing industry made up most of the program.

Multi-Staging with Rotary Compressors

ROBERT B. HOLLAND
President, R. B. Holland Co.
San Francisco & Los Angeles

WHEN an owner selects equipment for a specific job he is interested in getting exact results for his product. He should select the equipment to suit. Today, along with other nominal equipment, owners should seriously consider multi-staging for their plants.

If a simple single stage system will do the job effectively, then by all means an owner should not consider a two or three stage system. However, many jobs demand the use of low evaporator temperatures. A single stage system may operate with low temperatures satisfactorily although on the border line between favorable and unfavorable condensing conditions.

In the San Francisco Bay Area, for example (Refer to Table 1) you might wish to maintain a storage room in a range of minus 15 to 20 F. If you have enough condenser surface and a short suction line the plant would run at 0 psig suction, 125 lbs. discharge (10 degree superheat) and with a discharge temperature of 280F. If, however, this same plant was located where condenser or cooling tower performance was effected by high wet bulb temperatures and the head pressure ran to 185 lbs., the plant would run about 340 F discharge temperature and a 13.5 compression ratio which is usually not recommended by the reciprocating compressor manufacturer. Note from the ACRMA Equipment Standard No. 413, part 2, page 11 (Table 2), that the manufacturers do not even show ammonia compressor ratings less than 0 psig suction, nor over 135 psig discharge. Further, for ratios of compression above 8.0, multi-stage compression is recommended and should be considered.

However, many operators put up with these conditions, following the false trend that booster compression was only for the big plant. In the past 10 years, especially, this theory has been exploded. Rotary compressors have done their share in routing this myth.

Let's discuss the subject of rotary booster compressors from the angle of application engineering, and from the practical rather than the technical side. As with most any machinery, much basically good equipment suffers in operation because of improper application and use. Let's also concentrate on ammonia boosters, as it is in the ammonia industrial field that these units find their widest application. (There are, however, rotary compressors operating with Freon 12 and Freon 22, mainly in conjunction with ultra low temperature test work, such as installations for the USN Electronics Lab. and Northrop Aviation Company. These installations are producing temperatures down to minus 114 F.)

Basically it is the job of a booster compressor to handle a large volume of suction gas at a low compression ratio. The inherent design features of the rotary unit are especially suited for such a job. As a matter of interest, it is related that European compressor manufacturers are already using rotary compressors for some single stage jobs.

Fig. 1 illustrates model A-120 F.E. S. Fuller Rotary Booster Compressor in operation at National Ice and Cold Storage Company, Oakland, California. This unit is operating at 10 inches suction and 25 psig discharge, with V-belt drive from a 60 hp motor, on approximately a 60 ton booster load.

Now let's take a look at the inside of a rotary compressor. Fig. 2 is an end view of the unit with expansion-end bearing retainer and head removed. Note in Fig. 3 that the compressor has a minimum of moving parts, basically consisting of a rotor with sliding vanes or blades revolving in a cylinder. The first reaction the maintenance engineer will get is there are no valves to grind or get out of adjustment, no connecting rod bearings to take up, no wrist pins. A small amount of time is required for inspection and overhaul, as compared to similar capacity reciprocating boosters. The reaction of a compressor design engineer is that there are no gas pulsations. The refrigerant suction goes in at a steady flow and out of the cylinder with a minimum of reheat loss.

Eccentric mounting of the rotor in the cylinder forms a crescent shaped gas space divided into many small compartments by the blades. Pressure difference between compartments is small, providing high volumetric efficiency and minimizing wear. The cylinder bottom is machined to the rotor diameter, establishing a wide sealing surface be-

Specific design of the rotary compressor unit discussed in this paper is as follows:

CYLINDER—One piece cast iron with cooling jacket. Suction and discharge openings are located on opposite sides of the cylinder avoiding reversal of gas flow (see fig. 2).

CYLINDER HEADS—One piece cast iron, bolted and doweled to the cylinder to maintain proper bearing alignment and coolant circulation.

ROTOR—Shaft machined from single steel forging with blade slots milled radially. (fig. 3).

BLADES—Heat treated plastic. Blades slide radially in the rotor slots and are forced out solely by centrifugal force. Beveled leading edges maintain an oil film with cylinder walls.

BEARINGS—Roller type.

LUBRICATION — A mechanical lubricator, belt driven from the compressor shaft (see fig. 4—a Manzell unit). (A special pressurized system is available for Freon refrigerants).

RELIEF VALVE—Set to open at 75 psi, discharging to compressor suction.

CONNECTIONS—Separate suction and discharge connections, suction strainer and discharge check valve.

DRIVE — Compressors are designed for electric motor and internal combustion engine speeds. Direct drive through shear pin flexible coupling or V-belt drive is used. If space is severely limited, vertical V-belt drive with motor mounted above the compressor is used. (see fig. 4).

BASE—A base for bolting to concrete or structural steel foundation is supplied with either direct connected or belt driven compressors. A cast iron extended base for mounting both compressor and motor is available for direct connected units.

Paper given before San Francisco Chapter, NAPRE, June 10, 1953.

TABLE NO. 1—DISCHARGE TEMPERATURES FOR VARIOUS OPERATING PRESSURES AMMONIA COMPRESSION

Condenser Pressures and Corresponding Temperatures	Suction Gage Pressures and Corresponding Temperatures														
	0 -28°	2.5 -22.3°	5 -17.2°	7.5 -12.6°	10 -8.4°	12.5 -4.5°	15.7 0°	17.5 2.3°	20 5.5°	22.5 8.5°	25 11.3°	27.5 14.0°	30 16.6°	35 21.4°	40 25.8°
105# = 65.9°	240	225	210	200	189	183	172	167	160	154	149	142	139	131	123
115# = 70.4°	253	238	223	213	202	195	184	179	172	165	160	154	149	141	134
125# = 74.6°	265	251	235	225	214	206	195	190	183	176	171	165	160	151	144
135# = 78.7°	277	262	246	236	225	217	205	200	193	186	181	175	170	161	154
145# = 82.5°	288	273	256	246	235	227	214	210	203	196	191	184	180	170	163
155# = 86.1°	298	283	266	256	244	237	224	219	212	205	200	193	189	179	171
165# = 89.6°	308	293	276	266	254	246	233	228	221	214	209	202	198	188	179
175# = 93.0°	318	303	286	275	263	255	242	237	230	222	217	210	206	196	187
185# = 96.2°	328	312	295	284	272	264	251	246	238	230	225	218	214	204	195
195# = 99.3°	336	321	304	292	280	272	259	254	246	238	233	226	221	212	203

Add 15 Deg. to above temperature for each 10 Deg. superheat in suction *(—from NAPRE Pocket Data Book)*

tween inlet and outlet. There is a double rotary shaft seal to prevent refrigerant leakage or air infiltration. The seal chamber is filled with oil and equalized to the compressor discharge through a two way check valve to maintain atmospheric or positive pressure at all times.

After operating a short time the cylinder wall becomes highly polished. The blade wears very slightly extending itself to take this up. As indicated in Fig. 2, the complete cylinder heads and seal rings are jacketed. A secondary oil coolant is circulated through the jackets and through a water cooled heat exchanger, furnished with the compressor, by a small recirculating pump driven off the main compressor shaft (See Fig. 4). This system eliminates the possibility of a freeze-up in the jacket during operation or shut-down.

On F.E.S. Fuller units, the cylinders are generally long and of small diameter to provide maximum internal wall surface for heat dissipation. The slight additional friction horsepower is more than compensated by this heat dissipation. The smaller diameter cylinders provide less blade standout which results in less strain and wear on the blades.

Having examined the rotary compressor outside and inside, let's now consider the selection and application of these units. The rotary booster is designed for applications in ranges of minus 70 F to minus 20 F suction temperature, and minus 40 F to plus 30 F saturated discharge temperature. That does not mean refrigerants are handled in one stage from minus 70 F suction to plus 30 F discharge. This is equivalent to 45 psig rise in pressure. We have other limitations such as: Pressure differential across the machine must not exceed 45 psi; maximum compression ratio for ammonia is 8 to 1; and maximum discharge temperature is 300 F. With these limitations in mind, the rotary compressor manufacturer has made capacity and horsepower curves for each size.

To get an idea of the range of sizes available the reader should examine Table 3. Note that each of the 21 models has a nominal rpm to coincide with available standard motor speeds

TABLE 2—NH_3 COMPRESSOR PERFORMANCE* AT VARIOUS OPERATING CONDITIONS FOR VERTICAL SINGLE-ACTING MACHINES.

Pressure & Corresponding Saturated Temperature of Suction Gas		Discharge Pressure, PSIG															
		135		145		155		165		175		185		195		205	
		Corresponding Saturated Temperature, °F															
		78.7		82.5		86.2		89.7		93.0		96.2		99.3		102.3	
Pressure PSIG	Temperature °F	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON	CFM TON	BHP TON
0	-28.0	12.34	2.51														
5	-17.2	8.42	2.02	8.64	2.12	8.89	2.22	9.16	2.32	9.40	2.41	9.66	2.50				
10	- 8.4	6.36	1.694	6.53	1.782	6.70	1.869	6.84	1.955	7.01	2.04	7.16	2.12	7.35	2.20	7.53	2.28
15	- 1.0	5.09	1.449	5.21	1.531	5.34	1.611	5.45	1.690	5.56	1.765	5.67	1.839	5.79	1.911	5.93	1.980
20	5.5	4.28	1.270	4.39	1.341	4.46	1.412	4.55	1.482	4.64	1.552	4.72	1.621	4.80	1.688	4.90	1.755
25	11.3	3.69	1.127	3.75	1.193	3.84	1.259	3.91	1.324	3.98	1.387	4.06	1.449	4.12	1.509	4.20	1.568
30	16.6	3.24	1.011	3.31	1.073	3.38	1.133	3.44	1.193	3.50	1.251	3.56	1.307	3.63	1.363	3.69	1.419
35	21.4	2.92	0.910	2.96	0.971	3.00	1.029	3.06	1.085	3.11	1.140	3.16	1.193	3.22	1.244	3.27	1.293
40	25.8	2.62	0.825	2.66	0.883	2.71	0.938	2.75	0.992	2.81	1.044	2.85	1.094	2.90	1.144	2.94	1.193
45	30.0	2.39	0.755	2.43	0.807	2.47	0.859	2.50	0.910	2.54	0.961	2.58	1.009	2.62	1.057	2.65	1.103
50	33.8	2.18	0.689	2.21	0.739	2.25	0.789	2.28	0.838	2.33	0.886	2.36	0.934	2.39	0.980	2.42	1.026

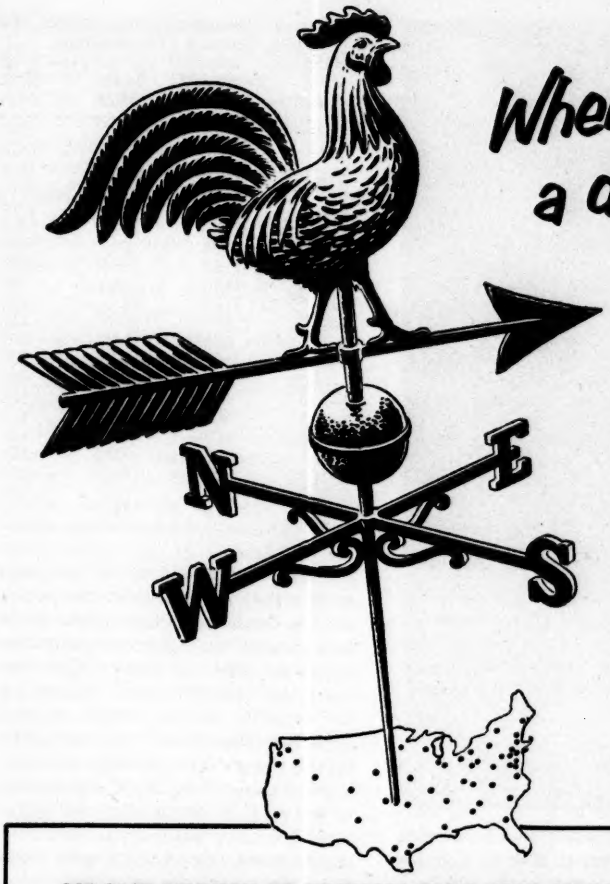
*Based on two-cylinder compressors with 6-in. bore and 6-in. stroke. For other compressor sizes, multiply by ACRMA machine factors.

The values above the heavy line in Table 2 are for ratios of compression above 8.0, and for these conditions it is recommended that multi-stage compression be considered.

$\frac{CFM}{TON}$ = average values of swept volume, in cubic feet per minute, required per ton refrigeration based on a suction superheat of 10 F and on liquid ammonia entering the refrigerant control valve at the saturated temperature corresponding to the discharge pressure.

$\frac{BHP}{TON}$ = average values of actual compressor brake horsepower per ton refrigeration.

(ACRMA Equipment Standards)



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Buffalo.....Buffalo Brewers Supply Co.
Rensselaer.....Eastern Chemicals Inc.
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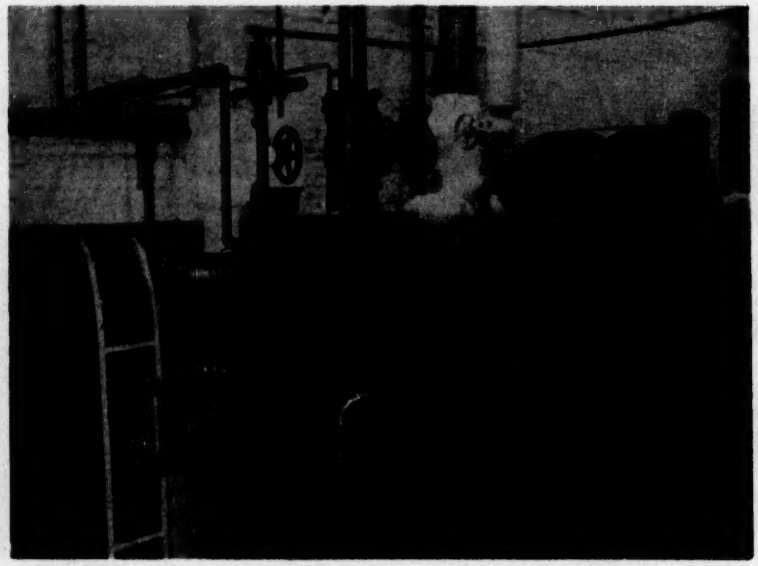

Fig. 1—View of compressor plant, National Ice & Cold Storage Co., Oakland, Calif. A model A-120 FES-Fuller Rotary Booster Compressor is shown in operation. Note arrangement of relief piping. One of two Ingersoll-Rand horizontal reciprocating second stage machines appears in background. Both machines are equipped with Manzell force-feed lubricators.

when units are direct connected. It is possible to use 1750 rpm motors up to and including 100 hp and 1160 rpm on 125 hp. If there is a wide fluctuation in load demand, consideration should be given to a two speed motor, or installing the total booster capacity in multiple units. This table also shows minimum rpm required for proper operation, and maximum rpm which is conservatively based on competitive data. Model A-120 has a nominal rpm of 690, which can be direct connected to a 720 rpm, synchronous speed motor, about 690 rpm loaded. However, if this unit is V-belted it's speed can go to 800 rpm for an approximate 16 percent increase in capacity.

Fig. 5 is a high stage load multiplier chart. Just as in selecting condensers, where we take into consideration dissipation of heat of compression and normally allow 15,000 Btu per hour per ton instead of evaporator load of 12,000 Btu per hour per ton, we must give this same consideration to selecting the second stage compressor capacity. For example, if a plant is operating at minus 40 F suction temperature and plus 20 F discharge temperature on a 100 ton load, the chart shows a 1.26 high stage load multiplier. Therefore, your second stage compressor must have a capacity of 126 tons at 20 F suction or 33.5 psig design second stage discharge pressure (Table 1).

On these curves, the saturation temperatures are shown for rating purposes and should not be confused with actual gas temperatures measured in the lines. The ammonia gas is superheated and any temperatures measured will be higher than the saturation temperatures shown on the capacity curves. These normal operating superheats are accounted for in the ratings. Ratings are also based on ammonia liquid sub-cooled within 10 F of intermediate temperature. The compressor capacity should be decreased 1 percent for each 5 degree increase in ammonia liquid temperature above the intermediate saturation temperature. For example, if liquid out of the intercooler is cooled to within 20 F or the intermediate saturation temperature, instead of the 10 F used for rating purposes, tonnage capacity of the booster is reduced 2 percent but the higher stage load remains unchanged.

Normal starting torque motors may be used with the rotary booster. Three percent should be added to load for belt losses when V-belt drives are used. As booster systems are normally started by placing the high stage compressor on the line and pumping down to somewhat below the normal intermediate temperature, this can be taken into consideration when selecting the booster motor. During this pull-down the suction is by-passed around the rotary. The booster may then be started by throttling the suc-

TABLE 3—RECOMMENDED SPEEDS FOR NH_3 ROTARY COMPRESSORS.

Model	Nominal RPM	Max. RPM	Min. RPM
A-11	1750	1750	1000
A-12	1750	1750	1000
A-13	1750	1750	1000
A-15	1160	1750	1000
A-16	1160	1750	1000
A-24	1160	1500	1000
A-25	1160	1500	1000
A-30	1160	1450	725
A-40	1160	1450	725
A-50	1160	1450	725
A-60	870	1000	500
A-70	870	1000	500
A-80	870	1000	500
A-100	870	1000	500
A-120	690	800	400
A-135	690	800	400
A-150	690	800	400
A-175	575	650	325
A-200	575	650	325
A-250	575	650	325
A-300	575	650	325

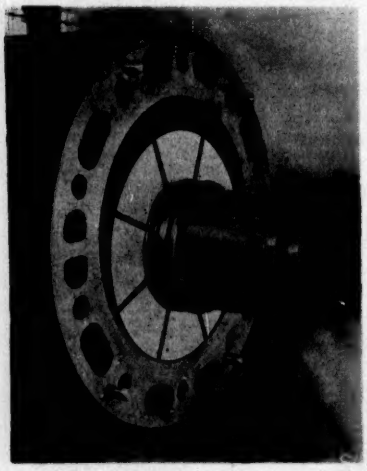

Fig. 2—Rotary compressor with expansion end-bell removed to show position of rotor. Vanes are forced outward by centrifugal force when in operation, but are wedged out here for demonstration purposes. Cylinder and end-bells are oil cooled.

Fig. 3—Rotary Compressor Rotor is a single steel forging. Roller bearings are shown in place.

tion valve and opening the discharge valve wide. Overloading of the booster motor can be prevented by keeping the suction valve throttled to maintain design suction pressure at the machine.

If a rapid pulldown is required, or if there is a load during pulldown and the booster suction cannot be throttled, the brake horsepower becomes greater than that shown for normal operating conditions. In that case the booster must be balanced against the high stage compressor through the range of pull-down conditions and the booster motor selected upon the basis of this study.

Booster motors should also be selected to handle possible load changes. The discharge ports of each rotary compressor are cut for its normal operating conditions for maximum efficiency. An increase or decrease of 25 percent in compression ratio will not effect this efficiency. However, greater deviations will result in some compression losses and an increase in brake horsepower requirements and discharge temperature.

At this point, let's make some comparisons with reciprocating compressors. In the ASRE basic volume data book, it is pointed out that at lower temperatures and low absolute pressures a very low density gas is available at the suction of a compressor. It is, therefore, essential that suction valves have little or no spring tension to insure the filling of the cylinder in the suction stroke. Also consideration must be given to suction line superheating of the gas as well as cylinder reheating inside of the compressor. That reference goes on to say that use of the rotary compressor has been very satisfactory due to lack of difficulty with the valves and also due to minimizing of reheating of the gas when entering the compressor.

Another point in comparison with reciprocating machines is that most manufacturers have available a limited size range of reciprocating booster compressors. Quite often too, there is a saving in rotary over reciprocating boosters in foundation costs and definitely in space requirements. This space requirement can become a factor when the units are located in expensive property areas. In fact, installations have been in what was considered lost space in existing plants. Lubrication problems with a rotary compressor are much simpler than on the reciprocating compressors. Any good refrigeration oil having a viscosity of 300 Saybolt seconds at 100 F is satisfactory.

It is possible to make automatic installations of rotary booster compressors although they are normally installed in plants that have full time operating crews. Semi-automatic operating refinements may be made. For example, in the relatively small cold storage plant in Honolulu, there was a problem of loading up the rooms late in the day. About 4:00 am. the load would be down sufficiently that the booster would not be required. To eliminate the suction gas going through the booster if it were shut-down without valving, a bypass line was installed between the inlet and outlet with a check valve. When the booster was operating, the check valve would be closed and as soon as the booster was cut out of the line the check valve functioned to by-pass the gas direct to the second stage compressors.

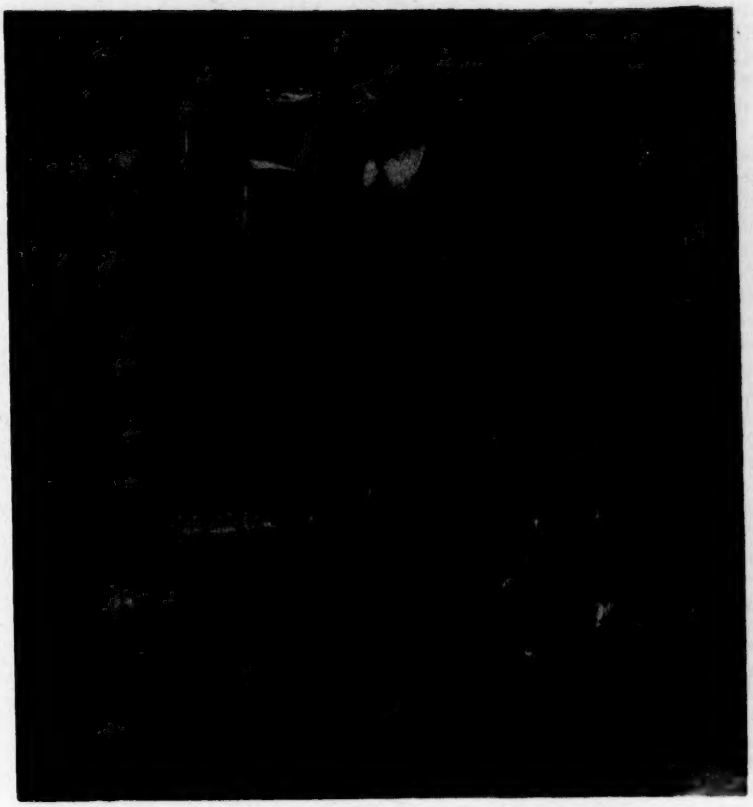

Fig. 4—Package unit for cramped quarters, consisting of discharge stop valve, strainer, relief valve and piping, motor, vee-belt drive, FES-Fuller Rotary Compressor, lubricator, coolant pump, coolant heat exchanger.

In the general application of these units there are many owners that insist they cannot afford to install a new booster. Analysis may prove they can ill afford not to install one. For exampie, an ice cream plant that is running short on hardening room capacity; with single stage compressors and the resulting room temperatures, the ice cream must be left in the rooms 24 hours to be sufficiently hardened for distribution to retail outlets. By reducing the evaporating temperature in the rooms and perhaps changing the type of surface, hardening could be reduced to say 12 hours, which would double the capacity of the rooms. Certainly the installation of the mechanical equipment would be far less costly than building additional room space, which in addition to initial cost represents continuing costs and rental of property.

There are also plants that have intermittent heavy loads of quick freezing, and perhaps 75 percent of the time operate on frozen food storage loads only. On these jobs a booster can be cut into the line to pull down

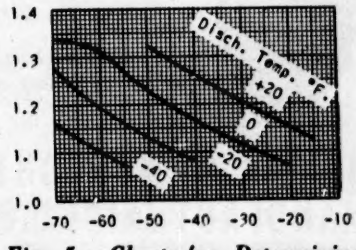

Fig. 5—Chart for Determining Higher Stage Load Multiplier. Shows Ratio of Higher Stage HP Requirements to Booster HP.

the suction pressure during the heavy loads, and during storage loads the booster can be cut off the line with the plant operating automatically on single stage.

There has been a tremendous growth in the quick freezing industry during the last ten years and, of course, this has accounted for a large number of booster installations. However, during the last few years quite a few of the smaller jobs have been mainly in ice cream plants. During the day when the freezers are operating and the load is heavy, the booster is cut into the line and when the freezers are through operating at night the boosters can be cut off the line, the plant going back on single stage compression. Booster refrigeration in these fields is here to stay, and specifically, rotary boosters are doing a job of convincing owners of this fact.

Warehousemen Expect Continued Prosperity

MOST refrigerated warehousemen expect their businesses to remain profitable over the next 18 months in spite of a predicted decline in business conditions generally, according to R. M. Conner, President of the National Association of Refrigerated Warehouses.

The statement, which is based on a business opinion survey being conducted throughout the refrigerated warehouse industry, was made at a meeting of the Association's Executive Committee in Kansas City, Mo.

Mr. Conner said that the attitude of most industry members can be summed up in this opinion from one warehouseman. "Folks are eating well and will continue to do so. If there is a drop in prosperity, I think many other industries will be hit before we are. Besides, we're a growing —and extremely vital industry."

Most of the warehousemen's optimism is based on the belief that occupancy of freezer storage space will remain high. With consumer demand for frozen foods rising steadily, seventy-seven per cent of the warehousemen believe that occupancy of freezer storage space will remain the same or rise during the next 18 months. Twenty-three per cent feel that freezer occupancy will drop, the NARW President said.

Mr. Conner, who is Vice President and General Manager of United States Cold Storage Corporation, Chicago, continued by saying that whether or not these estimates hold true will depend on a variety of factors. As an illustration, he cited the many reports of high labor costs and their effects on changing business conditions.

Also, he told of one warehouseman who reported that a short time ago, when supply sources were unstable, many of his customers would buy heavily on items they used just to be assured of having ample supplies on hand. Now, instead of storing five and six cars of frozen eggs, the distributor will store only one.

"Factors such as these more than over-all business conditions will have a temporary effect on our industry," Mr. Conner said.

Occupancy of cooler storage space, according to 59% of the warehousemen reporting, will remain the same during the next 18 months. Fourteen per cent believe that cooler occupancy will go up, and 27% feel that it will drop.

Scanning the national economy, 47 per cent of the refrigerated warehousemen predicted that over-all business conditions would remain approximately the same during the next 18 months. Forty-three per cent foresee a downward swing, and only ten per cent believe that the national economy would experience an upward swing.

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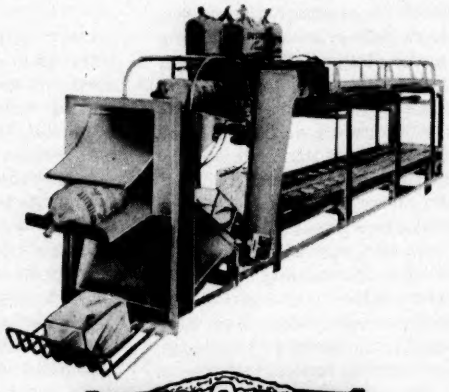

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Institute of Environmental Equipment Manufacturers

ORGANIZATION of a new manufacturers' association, the Institute of Environmental Equipment Manufacturers, has been announced by Dr. George D. Wilkinson, general manager. Institute headquarters will be at 30 Church St., New York, N.Y.

Typical low temperature testing scene. Courtesy, Glenn L. Martin Company.

Environmental equipment simulates low temperatures, high temperatures, salt-spray, sand-storm, rain, altitude, etc. It is used: (1) for laboratory testing of equipment to be used by the military and (2) to determine the effects of weather on such consumer items as plastics, automotive parts, washing machines, etc. Environmental equipment also is used in manufacturing processes; for example, to cool rubber so that it can be machined and to shrink metal parts for shrink fitting. This equipment simulates temperatures to -150F.

One of the Institute's most important functions will be to supply industry with technical data on environmental testing. Along this line, a library will be maintained, standards will be prepared in cooperation with the National Bureau of Standards, and technical bulletins will be disseminated both to industry and to educational and research organizations.

The Institute also will guide the Industry in providing maximum service to equipment users by: (1) maintaining and improving quality and service standards in production and marketing; (2) standardizing and simplifying designs; and (3) adopting trade practices and methods designed to preserve and promote fair and ethical competition.

Company members include: Alpha Electric Refrigerator Co., Detroit, Mich., American Research Inc., Bristol, Conn., Bemco Inc., Los Angeles, Calif., Harris Refrigeration Co., Cambridge, Mass., International Radiant Company, Port Washington, L.I., N.Y., Standard Cabinet Company, Rutherford, N.J., Sub-Zero Products, Cincinnati, Ohio, Tenney Engineering, Inc., Newark, N.J., Webber Manufacturing Co., Indianapolis, Ind.

Sausage Maker Installs Refrigeration

A CHICAGO sausage manufacturer, the Marhoefer Packing Company, Inc., recently installed an additional 140 tons of refrigeration and modified their processing plant. Three 38-ton Vilter compressors were installed, driven by 60 horsepower motors each. The Burge Ice Machine Company, Chicago, made the installation. This marks a discontinuation of service to Marhoefer of pipe line refrigeration from a nearby cold storage plant.

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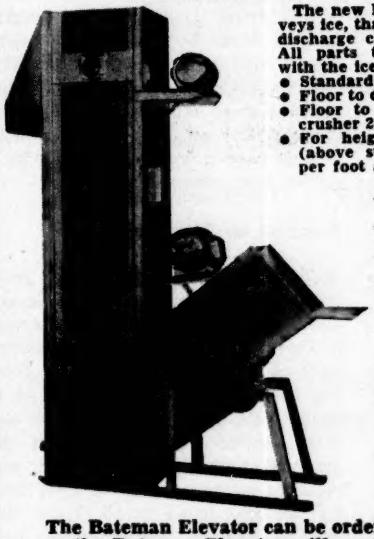

The new Bateman Elevator conveys ice, that has been crushed, to discharge chute for bagging, etc. All parts that come in contact with the ice are galvanized.

- Standard height 7' 6".
- Floor to discharge chute 72".
- Floor to top of hopper under crusher 24".
- For heights taller than 7' 6" (above standard height) $25.00 per foot additional.

FEATURES:

- V-belt drive from motor to gear box.
- Gears are enclosed and run in grease.
- ½ HP. motor to drive elevator.
- Top and bottom sprocket shafts run on roller bearings.
- Connecting chains for cups are of steel and galvanized.
- Cups do not ride sides of elevator.
- Take-up slack on chain is outside of housing for easy adjustment.
- At bottom of housing, pull-out pan provides easy cleaning of any left over crushed ice.

The Bateman Elevator can be ordered without crusher, as the Bateman Elevator will work with any crusher.
Price of Elevator, less motor $450.00
Elevator with Monarch Crusher, less motor $685.00
Monarch Crusher takes a one HP. motor.
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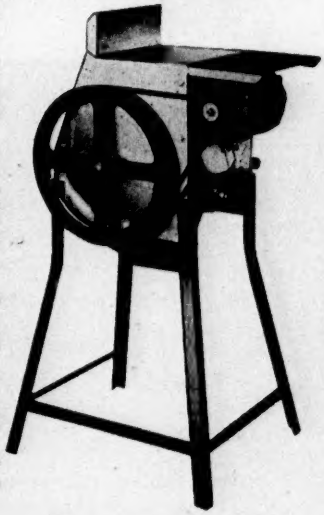
Bateman 25 CROWN ICE CRUSHER



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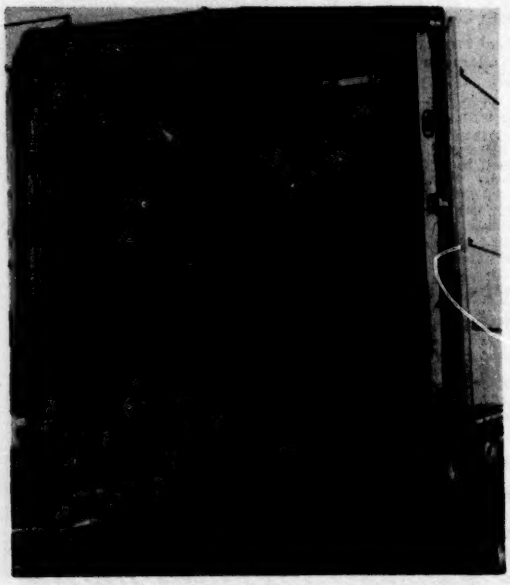
Portable Ice Skating Rink in Baseball Park

WHILE the Milwaukee Braves were not playing at home in July, at the 5 million dollar stadium completed last April, the management of Ice Capades, said to be one of the largest outdoor ice skating attractions in this country, bought two of the world's largest portable ice skating rinks from Buildice Company, Inc., of Chicago. An ice rink measuring 60 by 160 feet was installed, on the ground at the Stadium in such a way as to cause least amount of damage to the baseball field. For this purpose 33,700 feet of one inch pipe was used, this being made up into 20 foot long pipe coils, each coil being assembled onto the adjacent coil on the site. Connections were made with rubber hose and pipe clamps, with no insulation below the pipe coils.

Thirty cubic yards of sand were put below and between the pipes, flat irons, tack welded to the coils, spaced on eight foot centers, rested directly on sand fill. The Buildice mobile unit, as shown, has one four-cylinder verticle single acting compressor, v-belted to a 75 hp 1750 rpm electric motor, with other equipment as follows: one 55-ton Buildice evaporative condenser; one 10 in x 15 ft water cooled oil separator; one 16 in x 6 ft ammonia receiver; one 30 in x 12 ft multipass shell and tube brine cooler and one brine storage and mixing tank. Five hundred gals per min brine was circulated with two mobile units operating at 250 gallons per minute when ice is set and finished.

Ice Capades trucks carrying equipment for portable ice skating rink.

Laying piping on platform for portable ice rink.



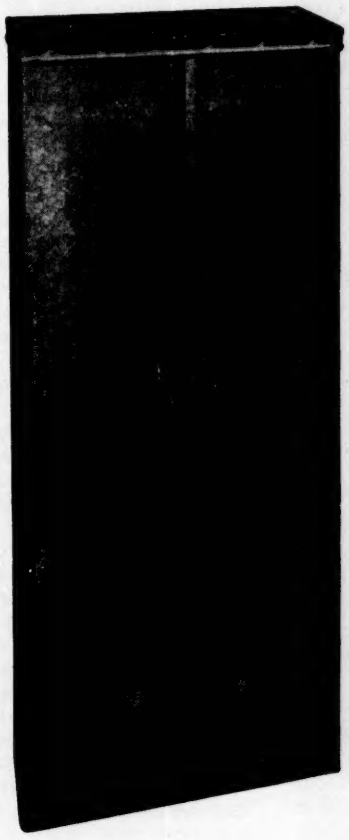
Refrigeration equipment for portable ice skating rink mounted on truck.

It took ten to twelve hours to get the ice in condition for skating. During intermissions the ice area was occasionally squeegeed of excess water. Proper skating conditions were maintained in temperatures of 90F or higher with the use of a tarpaulin which covered the ice between performances. The ice was maintained at one and a half to two inches thick.

In addition to the equipment mentioned above, the company bought four supply trucks, for the transportation of the equipment to the sites where the ice shows are to be held. Each supply truck is 32 feet in length, to hold 40,000 feet of 1 in seamless tubing with 3 ft 4 in manifolds. The pipe is shipped in 21 foot lengths, assembled seven pipes wide on 3 in grid sections. The pipes are connected with flexible rubber hose, made tight by a rubber hose clamp.

Success in Milwaukee

The Ice Capade show was a great success in Milwaukee, with a larger attendance than had been expected. It showed during one of the hottest days of the summer. When the show was over after one week, the removal of the platform on which the rink was built showed little damage to the grounds at the Stadium and this was repaired in short order, in good time for the next home game of the Milwaukee Braves. The engineer said that only rain could spoil the show, and during this engagement it only rained a little when there was no show on.



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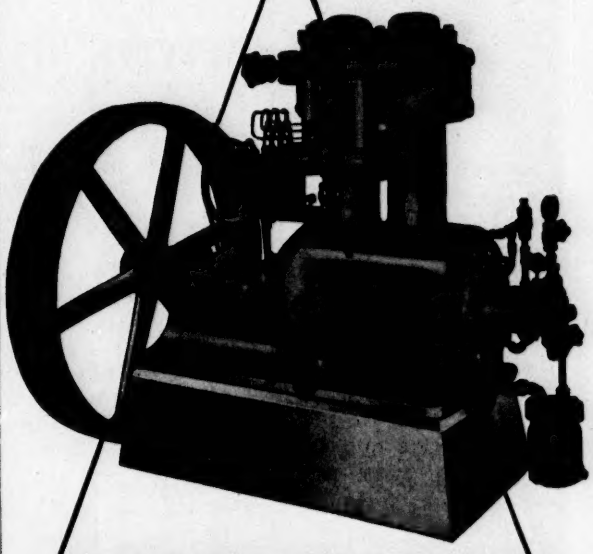

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Factors Affecting the Keeping Quality of Carrots in Cold Storage

A. G. NEWHALL
Department of Plant Pathology
Cornell University, Ithaca, N. Y.

OF THE 22 storage rots of carrots recently catalogued in a Cornell Bulletin by William Rader, three are responsible for most of the spoilage. None of these is commonly apparent to the growers or to the buyer at harvest time, yet the fungi which cause them must be presumed to be present when the product is placed in cold storage. What then are the factors that are responsible for starting the decay and what can be done to prevent or arrest the process so the carrots can be held for the maximum length of time without undue losses in spite of the presence of these microorganisms?

Two years of cooperative work on the part of Campbell Soup Company researchers and the writer, carried on mostly in eight cold storages in New York State but including work in Pennsylvania, Illinois, and New Jersey, have thrown much light on the weak place in the chain of events that starts a carrot on the road to quick decay or on the road to ten months of successful storage. That weak place seems to be the period between the day the carrot is harvested and the day its temperature becomes 31 to 32 F. The longer this period of time, the less chance the carrot has of surviving the long pull.

Extent of Study

During this study, approximately 80 tons of carrots, purchased from at least six growers, were handled in different ways. Monthly inspections of hundreds of tons were made, hundreds of carrot temperatures were taken, and recording instruments were placed in two cold storages. The details of all these experiments are too voluminous for publication here, but a summary of the results is in order.

In passing it should be mentioned that in New Jersey and Pennsylvania research had already shown no significant correlation between amounts of spoilage and field applications of fertilizers in amounts between 500 and 4000 pounds, or applications of borax up to 80 pounds per acre. Similarly, neither one to four foliar applications of urea nor one or two applications of maleic hydrazide before harvest had any notable effect in reducing storage rots.

Evidence in Illinois showed that carrots from the wet end of a field developed more spoilage than those from the dry end. This had been noted by Rader and was again observed by the writer in 1953. Mechanically harvested carrots were found to develop more spoilage than hand-topped ones. It was definitely shown that carrots affected with the virus yellows are a very bad risk since most of them develop a deep crown rot within a few months. But aside from sorting out the roots affected with yellows and avoiding undue bruising, there is not very much that growers can do to reduce storage rots. Late sown or immature carrots were found to keep just as well as more mature ones sown early.

When six tons of carrots from each of two farms were divided into one-ton lots and stored in six different storages, one lot developed ten times as much decay as the best one, indicating that the manner in which it was stored was largely responsible for the decay that set in. In another test pack from the same field divided and placed in two storages, the lot in storage A developed ten per cent spoilage while in storage B its sister lot developed 35 per cent spoilage in the same period. Much effort, therefore, went into devising different ways of handling and storing carrots to find what factor or factors were responsible for this difference in keeping quality.

The answer turned out to be too slow cooling. To be sure, when carrots from several fields were stored side by side in the same room, they did not all keep equally well. Undoubtedly some are more heavily infected than others at the time they are brought in. But there seemed to be greater differences among different storages than among different lots having different origins, and usually these differences among storages were related to the speed of cooling during the first two weeks of storage.

Molds on Containers

Early in the study the question came up as to the danger from the quantities of molds that often develop on wooden storage containers in cold storages. Rader found some pathogenic molds could be recovered from moldy crates. However, our experiments, in which crates that previously had contained rotting carrots were compared with new crates and with crates variously disinfested with fungicides, indicated that the containers are not important sources of infection.

Varnishing or shellacking the crates was tried but with little or no effect. The type of container, whether basket or crate, did not seem too important though crates pile better, shift less, and permit a little more circulation of air. In one experiment, carrots in sealed drums developed bad odors, flavors, and a rapid decay in about two months' time.

Although it is generally agreed that products should not be stored in a wet condition, in three tests where carrots were allowed to be rained on before storage, there was a trifle less spoilage in two of these packs than in dry carrots.

In five separate tests quantities of carrots were washed in ton lots, washed and precooled either in ice water or in a draft of cold air, or were washed and waxed. The washing itself had no beneficial result nor did the waxing, but when combined with precooling, washing definitely reduced spoilage. The washing process could be costly if carrots come in with lots of dirt on them. Moreover, it would undoubtedly result in lots of surface injury.

Washing Not Recommended

The danger of spreading several disease organisms in such a process may be considerable. Washing, therefore, even in ice water is not recommended. However, if precooling could be achieved in a stream of cold air, it might have real possibilities. It is noteworthy, however, that carrots in one-ton lots from five different growers all kept very well for ten months when precooled before storage at 31 F.

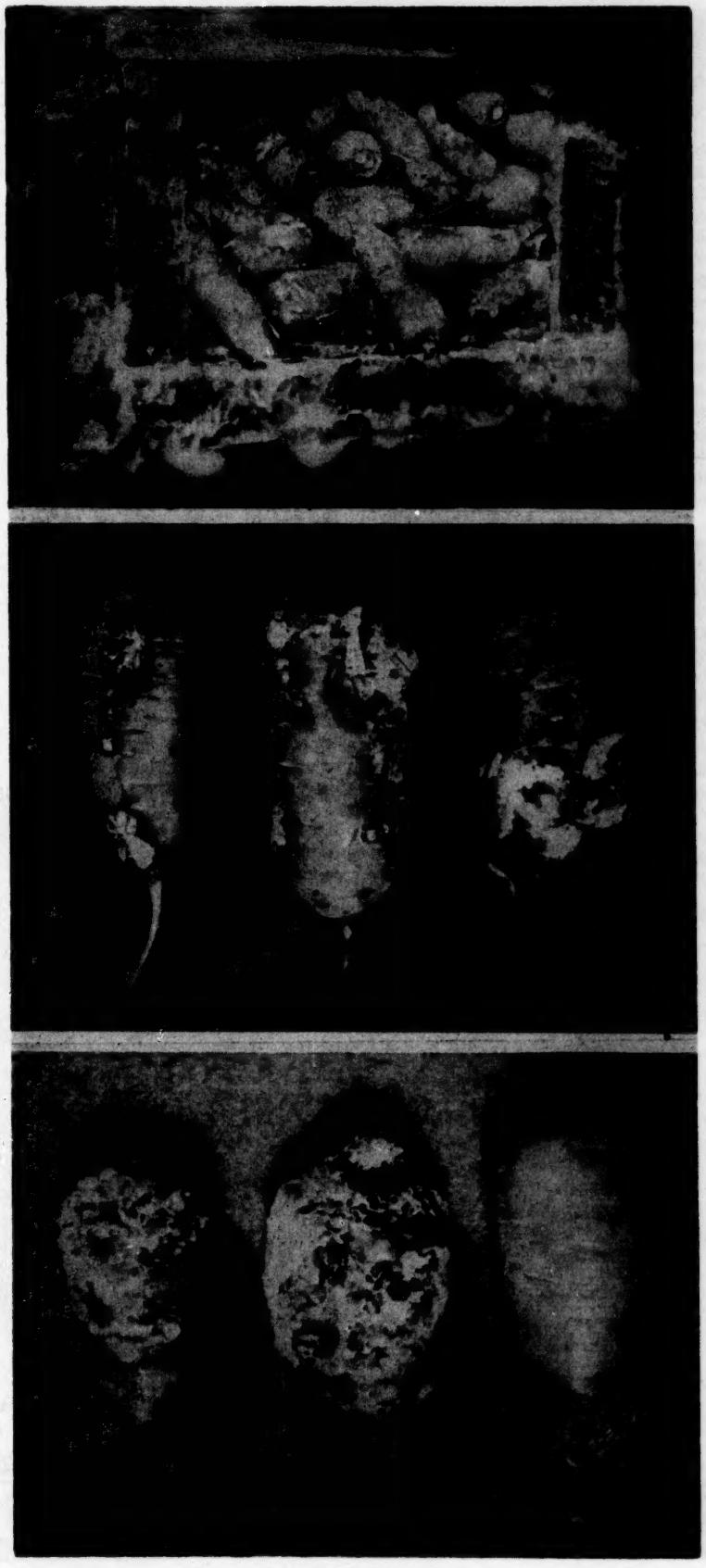
Carrots with excessive amounts of dirt on them as they came to storage were not predisposed to rot, nor did piling soil on several crates after they came in cause more rotting.

A number of liquid fungicides were used as instant dips and several dust formulations were employed as the carrots were brought from the field in both seasons. Results were erratic and not conclusive, due partly to lack of spoilage in the checks. This phase of the work needs further testing, especially for the control of Botrytis grey mold, the disease most commonly met with in the latter part of the storage season. Until more research is done, however, no recommendations as to the use of fungicides on carrots in storage can be made.

One of the surprising things repeatedly met with was the resistance to cooling offered by carrots, due to their internal respiration. Temperatures within the carrot were often one to two degrees higher than the room temperatures even after six months of storage. Moreover, at each elevation of the room temperature, the spread between room and carrot temperature increased. This is why slow cooling enables the carrot temperature to continue to favor the fungus and points to the need for rapid cooling. Slow cooling also results in greater total amount of heat generated, as well as moisture loss. For carrot temperatures to come down to 32 F, room temperature must be a degree lower.

Freezing Point of Carrots

This brings up an important question. At what point do carrots freeze? The U. S. Department of Agriculture gives the freezing point of carrot tissue as 29.3 to 29.7, but when 20 tons of both upland- and muck-grown carrots were stored in a room held at 30 F with a fan on continuously, a good deal of freezing occurred in five weeks' time and subsequent losses from rotting were very heavy. It was concluded, therefore, that a temperature of 30.5 to



Top. A nest of rotting carrots is revealed by removing two slats from a crate, covered with the white mold of the fungus Rhizoctonia carotae.

Center. The most common carrot cold storage trouble, "Crater rot", is caused by a low temperature fungus.

Lower. The "Cottony soft rot" fungus can also grow at temperatures down to 32°F.

31 F was probably as low as it is safe to go even during the first month or two of storage. This calls for accurate thermometers, close supervision, and adequate circulation of air.

By placing one ton lots of carrots from the same field in several storages where temperatures were carefully controlled, it was found that in one storage where spoilage eventually was the greatest, the room thermometer had been indicating an air temperature two degrees lower than the true one all season. It is important to have a thermometer with the marks on the glass rather than on the background because the glass sometimes slips down. It should be a thermometer that is known to be accurate at 30 to 32 F since the welfare of a rather expensive product depends in part on this little instrument.

In the storages where this work was conducted, the greatest loss during the first four months of the storage period was due to crater rot, caused by *Rhizoctonia carotae*, which apparently can be controlled by promptly reducing the carrot temperature to 32 F. During the latter half of the storage season, Botrytis grey mold, Rhizoctonia crown rot, and Stemphylium black rot were the most prevalent diseases. These also were most severe in the slow cooling rooms.

Humidity Important

High humidity is important for the long pull. In our experiments and observations, humidities above 90 per cent were in themselves not conducive to more spoilage provided the temperatures were brought low enough, soon enough after the storage period began. Where storage losses were controlled by prompt cooling, test lots weighed just as much at the end of ten months as they did on the day they were put in. In fact, two of them gained a few pounds at humidities above 94 per cent.

One of the cardinal weaknesses in carrot cold storage practices of today is the too rapid filling of rooms with too warm a product in the absence of adequate refrigeration and air circulation. It did not make very much difference where fans were located as long as circulation was adequate. However, in piles of crates 14 high in the absence of good circulation, the carrot temperatures in the top crate were sometimes two or three degrees higher than in the lowest crate. Fans moving air over the tops of the piles helped this situation better than fans down on the floor in the aisles.

Observations indicated that in addition to prompt cooling and holding at 31 F, carrots should not be so close to coils that they freeze or receive drip from coils during defrosting. They should not be piled in large blocks without adequate aisles to permit rapid cooling overnight before the next block comes in. They should be held at high humidities for the long pull, but the higher the humidity, the more important it is to cool carrots promptly to 31 or 32 F, for a combination of humidity and just a few degrees above freezing is an invitation for storage rots to go to work.

While these studies did not rule out the possibility that someday a useful fungicide may be found for the control of Botrytis grey mold, they definitely indicated that until that time, the greatest benefit will come from closer attention to more prompt cooling as soon as carrots come out of the field and to maintenance of them at a temperature close to 31 F.

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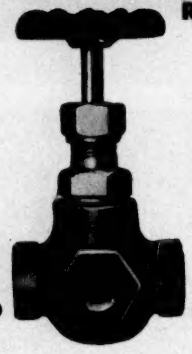

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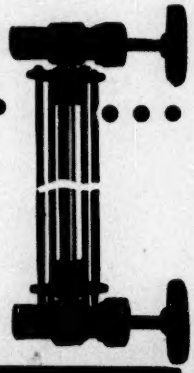

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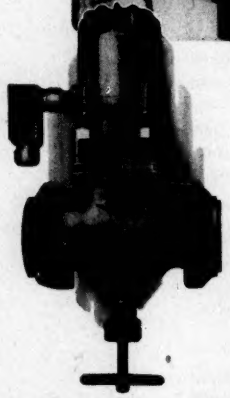

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Automatic Control of Cooling Water Treatment

WATER used for cooling must be properly treated to avoid the scaling and corrosion of expensive processing equipment. Maintenance and replacement costs due to inadequately conditioned water run annually into the millions—and besides, there is a correspondingly high loss of operating time.

A striking example of the destructive nature of aggressive water is found at the Tinker Air Force base, Oklahoma City. According to the Air Force engineers, replacement costs for pipe alone, in the recirculating system, amounted to more than $80,000 over a ten-year period. In addition, a 42-inch main had to be replaced—itself a costly project. The pipes and the main were damaged despite the conscientious use of water treatment by best known methods then available.

Wooden cooling equipment is also damaged by inadequately treated water. Although wood has a remarkable natural durability, it is put to a most unnatural use in cooling towers. There it is subject to chemical and biological attack from impurities. Wood in cooling towers exposed to these impurities has been found to deteriorate in as little as three years, again requiring expensive and frequent replacement.

The corrosiveness of some natural waters results from dissolved impurities, high temperatures, and extremes in pH. It's necessary, therefore, in every operation, refrigerating plants included, where water is employed for cooling, to properly and adequately condition it prior to its use. Fortunately, chemical treatment methods have been developed to prevent scaling and corrosion, and more are perfected each year. Further, the application of carefully engineered control instrumentation is making it possible to have automatic, safe and sure chemical treatment continuously, thus maintaining cooling water at optimum conditions.

Nature of the Problem

Scaling of metallic processing equipment is caused by cooling water which contains such impurities as calcium and magnesium carbonates, bicarbonates, and dissolved gases (sulfur dioxide, hydrogen sulfide, oxygen and carbon dioxide.) Some scaling is desirable, as the protective calcium carbonate films will reduce corrosion rates. However, excess scale reduces both heat transfer efficiency and pipe capacities. Scaling in recirculating systems can be minimized effectively, where soft and medium hard waters are used, by controlling the dissolved solids content of the water by continuous blow-down.

Continuous blow-down itself prevents several problems, because excessive blow-down defeats the purpose of recirculation—namely, to conserve water and chemicals. Also, as the trend towards sewer rentals based on volume of flow becomes more widely adopted by sewer authorities, blow-down (if excessive) may not have any economical advantage over more costly scale prevention methods such as chemical precipitation and settling.

Corrosion Inhibitors

Corrosion of metallic processing equipment is most efficiently minimized by the use of inhibitors. These include sodium dichromate, which, when added to most alkaline waters, will form insoluble, protective films on surfaces exposed to the water. While chromatic inhibitors reduce tuberculation and clogging of pipes, they are effective only when continuously applied and in sufficient concentrations. There is very little residual protective effect when chromate treatment is discontinued; therefore, corrosion control by manual feeding of sodium dichromate has proved to be inadequate. Continuous well-controlled feedings systems are needed to obtain maximum benefits from the use of inhibitors.

Wood Deterioration

As far as wooden cooling towers are concerned, the problem becomes one of preventing deterioration. Tests have proved that neutral salts have little or no effect on woods; but the principal constituents of woods, cellulose and lignin, are attacked by acid and alkaline waters respectively. In the case of delignification, sodium carbonate is known to be the specific agent. Sodium carbonate is always present in alkaline waters, and delignification is ordinarily the principal problem when these waters are used in wooden towers. Bicarbonate salts always exist in solution with carbonate salts in definite amounts which vary in accordance with the Law of Mass Action. Fortunately, the ratio of sodium bicarbonate to sodium carbonate in water solution increases as the pH is decreased. Adjusting pH downward is a simple method of reducing sodium carbonate concentrations and consequently of suppressing delignification of wood towers.

It is evident that the deleterious effect of acids, alkalies and sodium carbonate can be minimized by maintaining the pH of cooling water at an optimum, nearly neutral value. In addition, since biological deterioration of wood is caused by fungi which attack the cellulose, it is necessary to maintain the pH of the water slightly on the acid side in order to inhibit fungi growth. With pH, inhibitor concentration, and dissolved solids concentration continuously controlled and properly maintained, cooling water problems can be reduced to a minimum at great savings.

Tinker Field Installation

A completely automatically controlled cooling water treatment system has recently been installed at the Tinker Base. Mr. F. C. Dickinson, mechanical and electrical engineer for Air Installation Division, and Messrs. Herbert Lang and Earl Shaffer, project engineer and chemist, respectively, worked with consultants of W. H. and L. D. Betz Co. in the initial development of the chemical treatment methods for this system.

The problems involved at Tinker Field are identical to those at other typical installations. At peak loads, approximately 30,000 gpm of water are recirculated. Raw water is alkaline, having a pH of 8.1 and a total hardness of 210 ppm.

According to Maj. Gen. F. S. Borum, Commanding General, more than $1,500,000 worth of equipment had to be protected, and replacement and operating costs had to be reduced. Manual chemical treatment supplemented with periodic laboratory checks was tried but proved inadequate. Tinker engineers decided to make maximum use of automatic controls—they even succeeded in automatically controlling the addition of sodium dichromate.

The instrumentation consists of four separate measuring and control systems, namely:

(1) A continuous pH measurement and control system.

(2) A system which continuously measures and controls the sodium dichromate concentration at 250 ppm to inhibit oxidation.

(3) A system which automatically and continuously measures and controls, by means of a continuous blow-down, the concentration of dissolved solids.

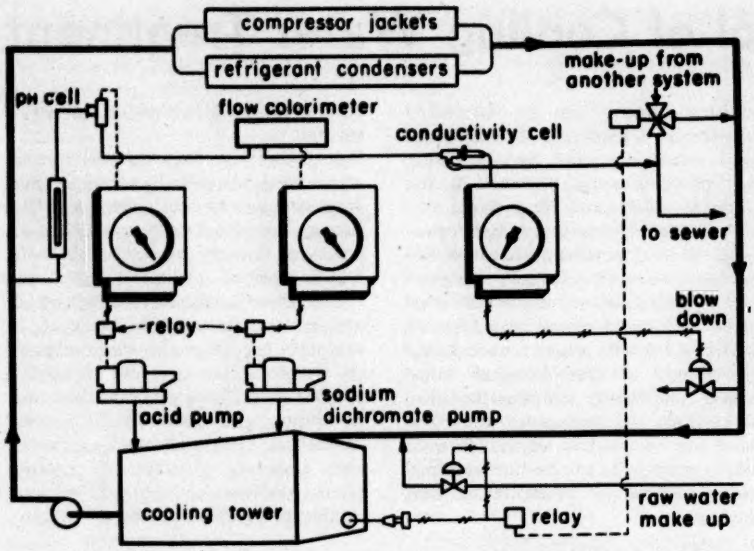

Fig. 1—Graphic panel at a water tower installation equipped with ElectroniK instruments controls pH, concentration of sodium dichromate and dissolved solids. Primary elements are inside the cubicle.

(4) The control of make-up to maintain the desired quantity of water in the circulating system.

Automatic Chemical Control

The pH system consists of a Brown ElectroniK pH recording and controlling potentiometer, a pH flow-through electrode assembly and amplifier, and a proportioning pump. This system continuously measures and records the pH of the water and accurately controls it at a pH of 6.5 to 6.8 by the addition of minute amounts of sulfuric acid. The emf signal received by the potentiometer from the electrode assembly and amplifier varies according to the pH and is translated into corresponding air signals which vary from 3 to 15 psi and which, by means of a pneumatic-electric relay and a Thymotrol control, unit, are in turn translated into proportionately varying pump speeds.

The unique, controlled feeding system for the oxidation inhibitor consists of an ElectroniK recording and controlling potentiometer used in conjunction with a flow colorimeter and a proportioning pump.

The colorimeter is a convenient and accurate primary element for continuously measuring the sodium dichromate concentration in the cooling water. It is operated directly from a 115 v, 60 cycle, power source and consists of a 5 cm Corex glass sample cell with inlet and outlet ports, two blue-sensitive phototubes, tungsten lamps, cooling coils, shutters, electronic amplifier and filters to isolate the spectral band of sodium dichromate. It has an emf output signal varying from 0 to 50 millivolts, depending on the concentration of the dichromate in the water flowing through the cell. The signal is fed to the potentiometer which records concentration in ppm and controls the pump the same way the acid pump is controlled. The concentration of sodium dichromate is maintained at 250 ppm (plus or minus 5 ppm).

Controlled additions of sulfuric acid and sodium dichromate prevent corrosion, bacteriological attack of wood, biological fouling of pipes, and formation of scale in the cooling water system; however, control of sludge formation and of dissolved solids is also necessary to reduce maintenance costs to a minimum and increase heat transfer efficiency.

Continuous Blow-down

Concentration of dissolved solids is continuously measured by a conductivity measuring system based on the principle that the conductance of a solution is a function of the concentration of dissolved electrolytes. An electronic circular chart, recording and controlling potentiometer receives an a-c signal from the conductivity cell and in turn not only continuously records the dissolved solids content (conductivity) but also pneumatically operates a Honeywell diaphragm motor valve in a blow-down line. This controlled blow-down system minimizes excessive waste of water and results in considerable savings in chemical costs.

To replace water lost by blow-down, evaporation and windage, a Honeywell float-type liquid level con-

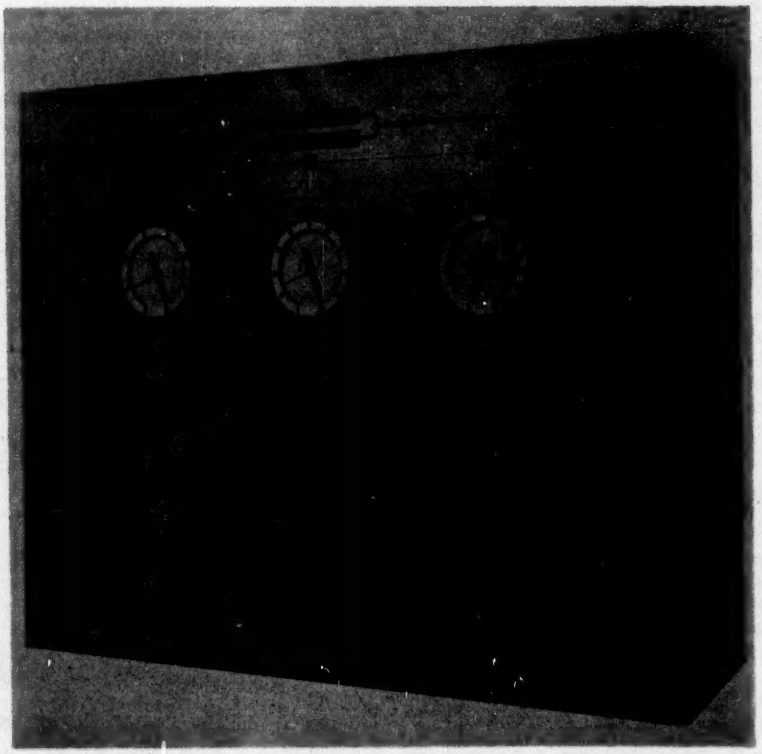

Fig. 2—Typical control system for chemical treatment of cooling water for refrigerating plant.

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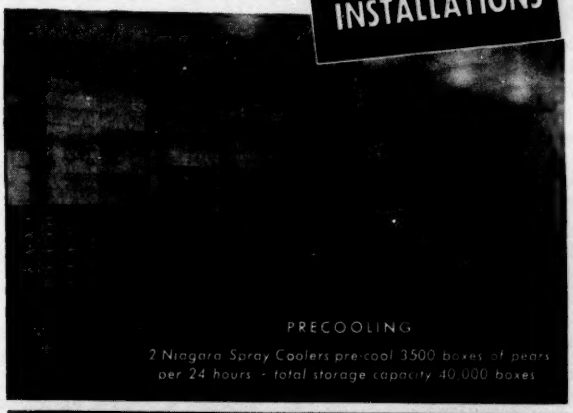
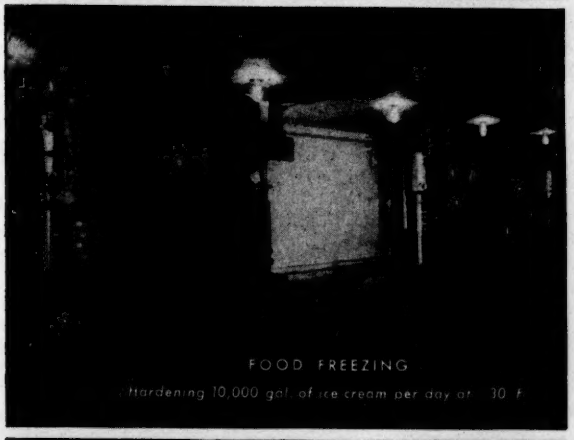


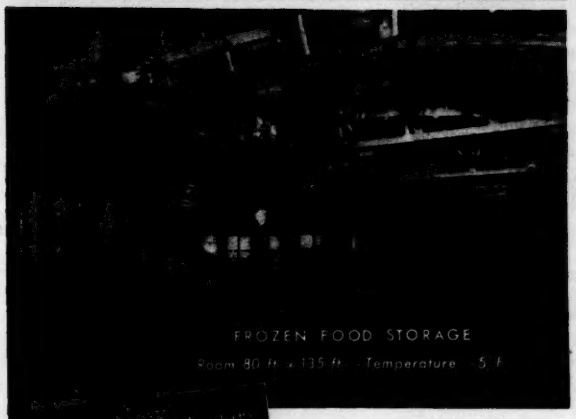
PRECOOLING

2 Niagara Spray Coolers pre-cool 3500 boxes of pears per 24 hours - total storage capacity 40,000 boxes



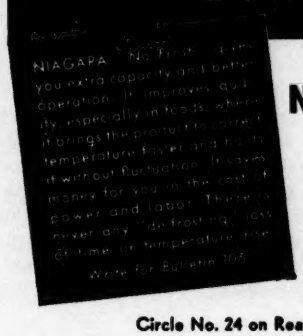
FOOD FREEZING

Hardening 10,000 gal. of ice cream per day at -30° F



FROZEN FOOD STORAGE

Room 80 ft. x 135 ft. Temperature 5° F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you extra capacity and better
operation. It improves qual-
ity especially in foods, since
it brings the product to correct
temperature faster and holds it
without fluctuation. It saves
money for you in the cost of
power and labor. There is
never any defrosting loss
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Sales Engineers in Principal Cities of U. S. and Canada

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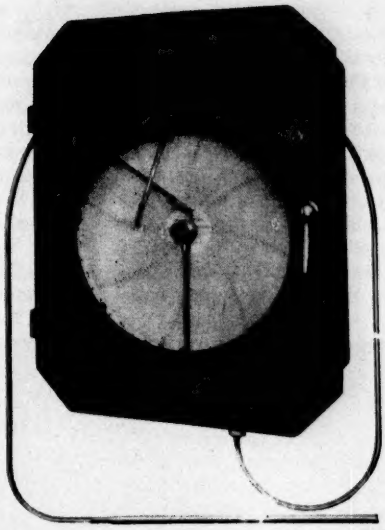


Locker Room Story

TAYLOR'S Locker Room Recording Thermometer is on duty around the clock. It gives you an accurate, continuous report of the temperature inside your locker room, from a convenient point *outside* the room. You'll have a permanent, indelible, degree-by-degree, seven day temperature record from the instant the instrument is put in operation.

Here's protection for you, in the irrefutable evidence of temperature maintained, in case of damage claims: protection for your customers, who can assure themselves at a glance that their foods are kept safely.

Thanks to Taylor's exclusive Accuratus connecting tubing the instrument may be placed as far as 100 ft. away from the highly sensitive temperature bulb, without effect from varying temperatures through which the tubing passes. The case is moisture proof and corrosion resistant. 12" charts, graduated in degrees and hours, can be changed in a matter of seconds.

For full information on this and other Taylor refrigeration control systems, consult your Taylor Field Engineer, or write for **Catalog 300.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

Circle No. 25 on Reader Service Card

troller and stabilized pilot assembly pneumatically controls diaphraghm motor valves on water influent lines. At Tinker Field there are two sources of make-up water: water from the air-field distribution system and water diverted from another process. A 3 to 15 psi air signal from the liquid level controller actuates a three-way valve so that the water from the second cooling system is used as make-up water, with raw water used only when the primary supply is inadequate.

The commander for this system is a neat and soldierly looking graphic panel (Fig. 2), developed in collaboration with Minneapolis-Honeywell's industrial division engineers. As a cubicle tube of instrument panelboard it contains all the instruments except the liquid level controllers. A portion of the cooling water flows from the 42-inch cooling water main through a 3-inch by-pass line, to the cubicle and through the measuring cells which are easily accessible for inspection and maintenance. The complete cooling water system is represented graphically on the front of the panel by raised lines and symbols of different colors, and the measuring instruments are located in the flow lines in their proper location so that their function is immediately apparent. All instruments are designed so that any or all variables can be manually controlled at any time.

Physical Layout Problem

The Tinker Field cooling water treatment system presented a difficult control instrumentation problem in that the cooling tower (Fig. 1), was located approximately 1000 feet from the instrument control room, while the only available storage space for a year's supply of sulfuric acid and sodium dichromate was at the cooling tower. Proportioning pumps had to be located at the tower, but the by-pass water sample line had to be taken off the main near the instrument control room. It was important to eliminate to a great extent the lag in the control system introduced by the measuring units being 1000 feet downstream from the point where the acid and dichromate are added to the water. To do this, the 3 to 15 psi air signals from the ElectroniK potentiometers are converted by pneumatic-electric relays to electric signals which control the pump speeds through the Thymotrol units. The instrumentation thus combines the advantages of simplified automatic reset and adjustable throttling action, available with pneumatic controls, with the speed of electrical transmission.

Signal lights are located on the control panel to indicate water level and sources of make-up water. In addition, an auxiliary control panel is located in the pump house and, when necessary, it permits an operator to adjust manually the make-up valves and the pumps from a position near the cooling towers as well as from the instrument control room.

Completely automatic control systems for cooling water treatment are a present day reality for conserving water, and for reducing to a minimum the maintenance, chemical and replacement costs inherent with normal cooling water operations. These systems permit appreciable savings in operating costs because they eliminate the damage that would result from intermittent manual control with its wide fluctuations in pH, inhibitor concentration and dissolved solids concentration. Design engineers at Tinker Field expect the system, including the panelboard, to amortize itself in not more than two operating seasons.

Industrial Air Conditioning a Necessity —Not a Luxury

ONCE restricted to such specialized applications as textile and printing plants, industrial air conditioning is today a key contributing factor to the efficiency, health and safety of the production employee throughout industry, according to A. B. Waterbury, assistant chief engineer, Walter Kidde constructors, engineers and builders.

Mr. Waterbury said that there are any number of popular-priced, mass-produced items presently on the market that owe their existence to the fact that, somewhere along the line, air conditioning played an important role in the manufacturing process. Since many machine parts are now made under controlled air conditions, they can be assembled at some common point regardless of where they are produced. Fine and exact tolerances can be maintained regardless of plant location or weather conditions, and there are fewer rejects because of tolerances or corrosion on fine parts due to humidity. Also, laboratory testing and inspection can be based on standardized air and humidity conditions.

Increases Production

Industrial air conditioning can be used successfully to boost the production unit of output per man hour. However, the manner and extent to which it is applied to a specific industrial plant is largely dependent on the type of work. For instance, according to Mr. Waterbury, those who work seated at benches or at small machines, as in assembling small parts, inspecting finished parts or in packaging, require a larger amount of cooling in summer or heating in winter than employees who are on their feet or move about.

It is recommended that for employees seated at tables or benches, average air conditioning during the summer should be about 80° F. and 50 per cent relative humidity.

Air Conditioning a Safety Measure

One of the most common causes of accidents at production equipment—outside of sheer carelessness and foolish "kidding around," is the drowsiness induced by repetitive hand movements. The "fresh" atmosphere created by air conditioning has sharply reduced accidents and careless operation and has even bettered production.

While high temperature and humidity are an integral part of some industrial processes, it has been found desirable to sacrifice these conditions somewhat, in order to obtain better personal comfort for employees. For instance, in the glass industry, it has been found good practice to install air cooled walls to absorb some of the radiant heat.

Where volatile solvent vapors are handled, air conditioning is a necessity from the safety viewpoint. Where there are high concentrations of such gases, good practice requires two or three air changes per minute. If such vapors may be present in explosive proportions, the relative humidity should be increased to 50 or 60 per cent.

In terms of air conditioning equipment, the self-contained or packaged unit is gaining favor for two reasons: it eliminates the need for costly ductwork; and where the process consists of unit operations, it is possible to supply each operation or area with a specific atmosphere from individual air conditioning units.

President Eisenhower, Ex-Ice Man, Surprise Visitor to 36th National Ice Convention

Washington Meeting Emphasizes Merchandising and Management Problems in Forum Discussions--Dues Increased Passed--Cincinnati 1954 Convention City

PRESIDENT Eisenhower paid a surprise visit to the 36th Annual Convention of the National Association of Ice Industries meeting in the Hotel Statler, Washington, D. C., November 17 to 20.

The President stopped briefly during the Wednesday session, recalling his early experience as an ice man prior to his appointment to West Point. As a second engineer for the Belle Springs Creamery Co. in Abilene Kans. (see page 49, October issue, Industrial Refrigeration) it was his responsibility to see that ice was pulled in time for the morning train.

Said the President:

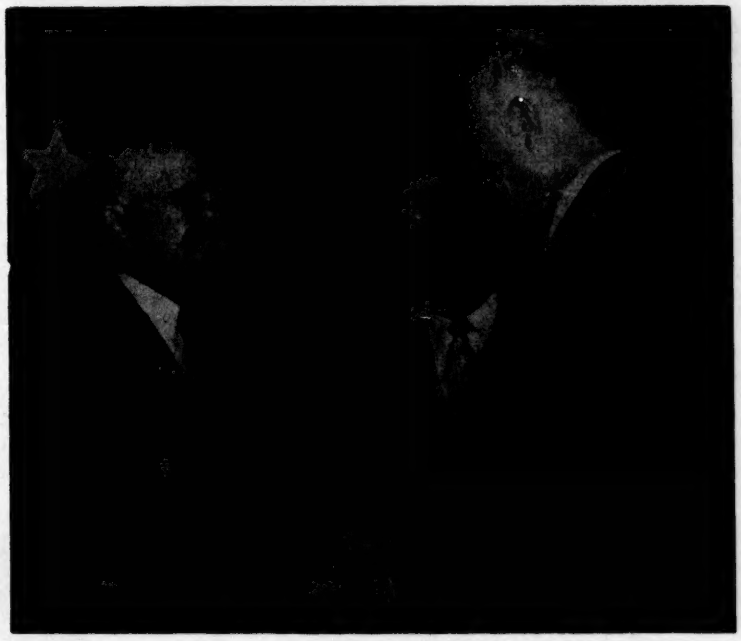
"They told me that this was the Association of the Ice Manufacturers of the United States, and I said that's one place I won't go unless I tell them something," said the President.

"Now normally I don't look for an opportunity to speak in public. But I want to look in the faces of people who are now the bosses in this industry, and see if they look as cold hearted as my boss used to look —because my job before I went to West Point was in the ice business."

"I was the second engineer in the Belle Springs Creamery Company in Abilene, Kansas," Eisenhower went on. "My work was from 6 at night to 6 in the morning turning out 300-pound cakes of ice for seven days a week. For some reason or other it gets warm on Sunday too. After quite a fight with my employer, I got what I thought was my due in the way of wages.

"I want to tell you as I welcome you to Washington that here is one group I have a certain kinship with, even though I was only one of the night men."

With a possible ten to twelve percent decline in ice tonnage for 1953 according to a preliminary estimate, members of the association got down to some basic planning to attain the optimistic theme of the convention to "Sell More in '54".



President Eisenhower is greeted by association president William J. Ayers and association vice-president Paul H. Andres. International News Photo

Officers Reports

Retiring President, William J. Ayres, Memphis, Tenn., and Executive Secretary, Guy W. Jacobs, pointed out the necessity of providing crystal clear, hard frozen ice man's ice to the public in such shape and size and at the time the consumer wants it. The speakers reminded their audience that tonnage figures were not a final determining factor in today's operation as many plants were securing more profit with present tonnage than in former high tonnage years.

It was the concensus that marginal plants will eliminate themselves, but that the industry can, with an aggressive merchandising program, develop a profitable market for the use of prepared ice for domestic use and commercial applications such as hydro-cooling, vegetable and fruit icing, car icing, chicken processing, meat-on-ice displays.

Department Activities

C. P. Austin, Director, Research and Marketing Dept. of NAII and Wm. T. Jobe, General Counsel, reported on the activities of their respective departments. Mr. Austin advised that the Purdue University study of channel icing versus bed icing revealed favorable reports for channel icing in keeping vegetables in top condition with no loss in weight and with about sixty percent less ice than used in bed icing. Other projects of the research department now in work or nearing completion include: Ion exchange process of water treatment, sewing machines to close wet strength paper ice bags, maintenance of vending stations, hydrocooling of peaches, poultry icing and continued studies on sweet corn icing and meat-on-ice displays.

General Counsel Jobe related the necessity for a continuing program in developing good public relations for the industry. Mr. Jobe briefly discussed major legislation to be considered at the next Congress such as the Taft-Hartley law revision, annual wage guarantee, shorter work week.

Officers for 1954 National Association of Ice Industries; President, Paul H. Andres, Oklahoma City, Okla.; First Vice-president, E. L. Gunn, Jr., Atlanta, Ga.; Second Vice-president, Richard C. Muckermann, St. Louis, Treasurer, George Steers, Kalamazoo, Mich.

Channel Icing

An optimistic message to the ice industry was sounded by Arthur G. Conn, Wrigley Stores, Detroit, who advised the convention that his organization spends over $70,000 annually for ice for channel icing vegetables and fruit displays.

Operating some 60 stores at present, Mr. Conn stated his company is opening eight new super markets with eleven new ones on the drawing board. In brief, the Wrigley stores are planning on a 20 percent increase in business in 1954.

With the aid of colored slides, Mr. Conn showed the method Wrigley stores use in channel icing. Shrinkage according to Mr. Conn has been reduced from 4½ to 5% with adequate bed icing to approximately 2½% with channel icing. Channel icing, said Mr. Conn, permits chilled moist air to permeate through the produce and also eliminates fruit insects.

Mr. Conn pointed out that produce is displayed with special attention being given to color detail and the ice channels regularly serviced during the day as ice is required.

For overnight storage, produce is removed from the displays, packed in steel containers and covered with the remaining ice from the channels and stored in coolers over night. This method of storage maintains the produce in top quality, ready for the channel ice display next morning.

Better Merchandising—Industry's Big Challenge

—How can we best sell what the consumer wants?
—Where and how can we develop new sales?
—How to advertise where prepared and party ice can be purchased.

Introducing

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ICE CHANNEL

Produce Ice Channels have proven to be one of the best methods of displaying produce—maintaining a constant temperature—and eliminating dehydration or drying out of the produce on display.
Produce Ice Channels save the high cost of installation and operation of Mechanical refrigeration and when used in fixtures equipped with mechanical refrigeration, eliminate the necessity of sprinkling and keep produce fresh and crisp without weight loss. Ice Produce channels give produce department both EYE and BUY APPEAL.

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Rear height	7"	Extended length	36"
Front height	4"	Elevation plate adds 3" to rear height if desired.	
Width	3½"		
Telescoped length	27"	Heavy duty electro zinc plated.	

Price Only $6.75 EACH
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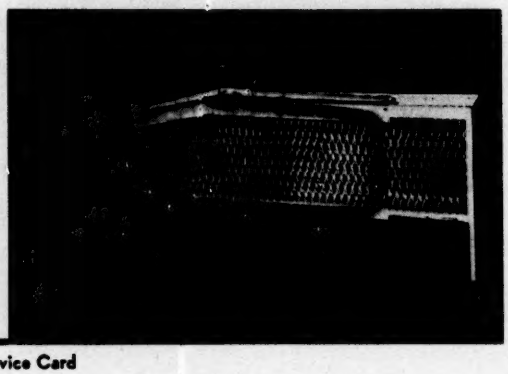

INDEX COUPON & SUPPLY CO.
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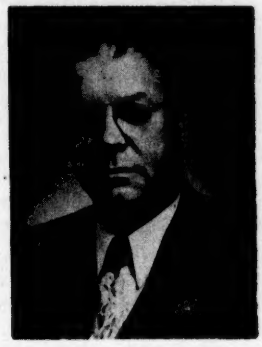
Circle No. 39 on Reader Service Card

—What is best domestic ice package size?

These and dozens of other questions all aimed at providing improved ice service in the form and at the consumers convenience were discussed in a fact finding Merchandising Open Forum meeting on Wednesday with President-elect Paul H. Andres as moderator.



Guy W. Jacobs, Washington, D. C.
Executive Secretary
National Association Ice Industries

One company reported it will have its biggest year in the ice business because it has intensively surveyed its potential markets and developed new customers by intelligent merchandising ice for vegetable and fruit cooling, meat-on-ice displays, vending machine sales and specialty or party ice. It was pointed out that more ice is being used now than ever before, but the ice man is not selling it. Some believed that former commercial customers now manufacturing ice, such as breweries, dairies and hotels could again be converted to customers.

It was the concensus that it was not practical to try to reestablish domestic routes to sell prepared ice to home freezer users, but rather to intensify efforts to sell through vending stations and retail stores where the ice can be obtained in convenient packages at the customers convenience. Some companies have been successful in convincing small commercial users of the economy of purchasing their requirements from vending stations. It was pointed out that the industry has not decided on a standard ice package. As an alternate plan of home delivery, the possibility was suggested that service companies, such as milk distributors, might be interested in delivering prepared ice to homes in some communities.

A southern ice company has found a small 7½ to 10-pound package of prepared ice most desired by customers. This company merchandises an 8-pound package through freezers in retail stores holding 20 to 50 bags. Freezers are owned by the ice company and packaged ice is sold to stores at 18 cents and retailed at 25 cents. Another suggestion was to place freezers in large apartment buildings and have the custodian handle package sales to tenants. Most companies use refrigerated trucks to deliver prepared ice from storage to distribution points.

The use of vending machines brought forth much discussion. Vending machines are increasing and while not a panacea for all ice sales, are proving productive in most communities. It was agreed that the public still needs to be informed on the availability of prepared ice through vending stations. Advertising in local newspapers, highway signs and direct mail can help merchandise. Highway sign advertising will also attract auto tourists who are using ice for containers, but have difficulty in locating ice supplies.

It was determined that vending stations could be profitable in towns of 1500 to 3000 population if conveniently located and well advertised. Some believe that stations have a customer potentiality within a radius of five miles of the vending stations.

It was emphasized that vendors must be maintained in good order, regularly painted and well lighted. The operation of ten to twelve stations if properly maintained can afford a maintenance man.

Loading of vendors is handled by one company through the use of laundry carts loaded at the plant and the vendor serviced from the cart. Entrance to the vendor is covered by a split tarpaulin to prevent loss of refrigeration.

Securing poultry icing business is a matter of selling service, not ice. The ice manufacturer must work close with processor and understand his problem, and must be certain that sanitary ice is delivered. One company, in the interest of service to customer, delivers 8 blocks on pallet which can be handled sanitarily and economically by fork lift truck at processing plant.

The answer to the future of the mechanical refrigerated car for transporting perishables may be summed up in a statement by the Department of Agriculture to the effect that "not within the foreseeable future will anything take the place of ice for normal car icing and the bulk of perishable products will not be refrigerated by anything but ice." Mechanical refrigerated cars are increasing but primarily are being used in transporting low temperature com-

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L. L. Swartz, Irvington Ice & Coal Co., Indianapolis, Ind.

J. C. Thompson, The Southland Corp., Dallas, Texas

M. W. Young, National Ice & Cold Storage Co., San Francisco, Calif.

Members of panel discussion on management, E. L. Gunn, Jr., Moderator. Upper Row: Preston A. Weatherred, Southwestern Ice Manufacturers' Association, Dallas, Texas; Karl V. Pflanz, St. Clair Ice Company, Belleville, Ill.; Wm. M. Pauley, Diamond Ice & Coal Co., Wilmington, Del.; D. M. Howell, Colonial Ice Co., Greensboro, N. C.; Lower Row: Walter J. Hintz, Borin Brothers, Detroit, Mich.; A. J. Gordon, Atlantic Co., Atlanta, Ga.; P. W. Easton, The Union Ice Company, Los Angeles, Calif.; Walter E. Bernd, Terminal Refrigerating & Warehousing Corp., Washington, D. C.—Chase Ltd. Photo

modities such as frozen foods and concentrates.

Other suggested markets for ice companies with a profit possibility are charcoal vendors at ice vending stations, vending packaged rock salt and sculptured ice.

Management Forum Considers Economical Production Methods

Management's responsibility to furnish the product and tools to back up intensive merchandising plans provided an informative Thursday session with Vice-President E. L. Gunn, Jr., Atlanta, as moderator.

As would be expected, economical production methods came in for considerable discussion. Transferring ice from storage trucks can sometimes be improved by conveyor equipment. Cost of labor in processing ice and packaging depends upon modern equipment. Figures for labor costs for processing and bagging prepared ice, including bags, ranged from $2.40 in smaller cities to $3.60 per ton in metropolitan areas.

Compensating ice service men suggested several methods. One company, after trying several plans now pays a guaranteed $5.00 to $6.00 per day salary and 10 percent commission on gross sales. Another plan suggested was a profit sharing pension trust fund arrangement to which employer and employee contribute equally. A number of companies have established their drivers as distributor-salesmen, the driver purchasing delivery equipment and ice from ice company.

The retail establishment exemption law requiring that a business in order to qualify for benefits under the law, must be a local operation and 75% of its business strictly retail is complex and it was recommended that if any company believes it can qualify, that full information be procured from local governmental agencies.

Accounting for the success of a truck icing business, one company provides showers for truck drivers, sleeping quarters, teletype service, local laundry and convenient dining facilities. This company provides in excess of 10,000 tons annually for truck icing, with some days in the season running as high as 150 to 200 tons of bunker and blown icing. The company has assigned one man to develop this business by personally soliciting processors and truckers.

It was suggested that the National Association could provide a service directory to inform refrigerated truck users of the availabiliy of truck icing stations.

Vacuum-cooling plants will precool about 50% of the lettuce crop this season in California, it was reported. At present, there are 33 such plants in California and 9 in Arizona. Average cost of permanent vacuum cooling plants is said to be approximately $250,000.00. Portable vacuum plants are being moved into growing areas and are doing a good job on corn, asparagus, cauliflower and peaches, with some experimental work being done on grapes. In some sections, ice companies are securing good business with possibilities of

Members of the Panel Discussion on merchandising, Paul H. Andres, Moderator. Upper Row: B. W. Franklin, Birmingham Ice & Cold Storage Co., Birmingham, Ala.; Joel J. Knight, Knight Ice Company, Atlanta, Ga.; G. Luther Rosebrock, Southern Ice Company, Charleston, S. C.; L. R. Kinney, Railways Ice & Service Co., Monett, Mo.; Lower Row: W. S. Elliott, City Products Corp., Chicago, Ill.; Paul Ashley, Central California Ice Company, Fresno, Calif.; George W. Heath, Oscar Mayer Co., Madison, Wis.; P. J. Mastin, People's Ice Company, Syracuse, N. Y. —Chase Ltd. Photo

expanding sales in coming years and are working closely with producers and processors. In other communities, some ice manufacturers believe permanent precooling plants will have an adverse effect on the ice business. Still, other ice manufacturers see this development as an opportunity for diversifying their operations.

Precooling trucks is a profitable venture for a large California ice company. This company has built portable equipment capable of precooling four trucks at a time. Truck precooling requires 2 to 8 hours depending upon load and temperature requirements. Trucks are cooled by circulating cooled air over ice tank holding 2 to 4 tons of ice, through rear door of truck covered by tarpaulin corridor connected to ice tank through which cooled air is forced by fans.

Automatic plant operation, reducing labor costs, has been successful in plants of varying sizes. One 40-ton plant is operated automatically for a 12-hour shift without attendants. It was conceded core pulling posed a problem that has not been completely answered in automatic operation.

Another plant of 90-ton capacity can step down to semi-automatic operation during off-peak season loads. The plant operating at full capacity requires 3 men, dropping down to two men in the fall and one man for winter operation. It was pointed out that some municipalities limit automatic operation and require an attendant present at all times during operation of plant.

Another company joins with a competitor during off season and closes one plant; all ice for both companies being manufactured in one plant.

Discussing further the subject of hydrocooling of peaches, one company reported peach growers are considering hydrocooling essential for their marketing. With portable hydro-coolers ice companies have an opportunity for good commercial business as each carload of peaches requires about four tons of ice.

One Georgia ice plant has developed a large poultry icing business. In this operation, all poultry is placed in large containers, after killing, with cracked ice prior to being fresh shipped or frozen. In this area approximately 2,000,000 chickens are shipped weekly, 50 percent of which are iced for shipment.

How snow ice, formerly a nonsalable item, was turned into a profitable business was related by a Tennessee ice company which now disposes of all the snow ice they can manufacture for sausage making, flavored snow confections and other processes.

Safety, Legislation, Finances, Opportunities Ahead

Teaching safe practices in the plant is not only a humanitarian program to avoid human misery, but is a sound business investment, stated W. F. Leonard, Jr., The Southland Corporation, Dallas, Texas. Mr. Leonard pointed out management's responsibility in adopting a continuing program of safety. Citing the cost of lost man hours as well as increased compensation insurance to plants, the speaker urged that every plant, no matter how small, adopt an aggressive program to make personnel safety-conscious.

Representative Samuel K. McConnell, Chairman Education and Labor Committee, U. S. House of Representatives, briefly outlined legislation to be presented to the next Congress. He pointed out the anticipated difficulty in securing agreement on changes in the Taft-Hartley law. In his opinion, administration of the act is vital and a clear definition of its administration must be included. Proper clarification of Federal and State jurisdiction is equally essential. There should be no easing of the provisions covering the secondary boycott and it is desirable, stated Mr. McConnell, that the law be flexible to meet conditions which may be caused by national emergency strikes.

It is most likely that changes in the Wage-hour law will be proposed with an increase in the minimum wage adopted. He pleaded for intelligent reasoning on the part of labor and management in facing the critical period ahead.

Treasurer George Steers, Kalamazoo, Mich., in presenting the treasurer's report, pointed out that while the association had a substantial surplus, expenditures had exceeded receipts for the past several years and it had been necessary to dip into reserves to meet the current budget.

Dues Increase

Following the Treasurer's report, President-elect Andres advised the convention of the Board of Directors' recommendation that dues be increased to offset in part some of the deficit. The convention acted favorably on the proposal, which provides that no change in the dues will be made for member plants whose production is 2500 tons or less annually. Plants producing 2500 to 100,000 tons annually will be increased from 6 mills per ton to one cent a ton. Dues of plants reporting a production in excess of 100,000 tons annually will remain unchanged.

It was announced that the 1954 convention will be held in Cincinnati, Ohio in 1954.

Freezing Space Short For Beef Price Support

THE nation would have to double its commercial refrigeration space in order to undertake a price support program on live cattle, a survey showed. This would add $250,000,000 to taxpayers' costs for buildings and equipment (not including land). Even if the freezers were privately built, the government would pay annual storage charges of around $70,000,000.

Such sobering statistics are coming out in the wake of the "cattlemen's caravan" which urged Agriculture Secretary Ezra Benson to grant 90 percent of parity supports on cattle on the farm, in lieu of indirect supports such as government buying of canned hamburger.

Joseph Colquitt, secretary of National Association of Refrigerated Warehouses, reported there are now 27,000,000 cubic feet of unoccupied space in commercial freezer plants. This is out of a total of 235,000,000 cubic feet. Much of this normally would be occupied as the Fall wears on by incoming shipments of frozen fruits and vegetables. If all the space were reserved for beef, Mr. Colquitt said it would store about 324,000,000 pounds of carcases.

Yet even this would be insignificant if the government adopted some of the suggestions "caravan" leaders made. One spokesman urged that the government immediately brand 10 percent of the nation's 93,000,000 cattle and give the owners 60 to 90 days to sell them to the government.

That would bring into slaughterhouses enough beef to feed the United States for three months. At present the nation works on a schedule of three or four weeks.

Windsor Passes Law on Abandoned Refrigerators

AN "ICE BOX" law, making it an offense to leave an unattended refrigerator or similar container where it could endanger the lives of children has gone into effect in Windsor, Canada. The law provides a minimum fine of $50 or six months in jail. It was approved after two four-year-old boys died at Windsor September 30 after being trapped inside an abandoned ice box.

Florida Ice Association Holds Annual Convention—Interesting Program

THE 28th annual convention of the Florida Ice Association was held at the Roosevelt Hotel, Jacksonville, Fla., October 11-13. The business program presented a wealth of information, and the entertainment and resulting publicity combined to make it one of the best.

One of the highlights of the convention was an address by Acting Governor Charley E. Johns, who announced that one of the chief projects of his administration would be finding additional industrial and commercial businesses for Florida. Mr. Johns is owner of an ice plant at Starke and a long time member of the association. He said he was proud to be an ice man and extended an invitation to all other Florida ice men to work with him to make Florida a bigger and better state.

President's Report

Presenting his annual report, president J. R. Gramling summed up the work of the past year and commented on the value of trade association membership. He expressed strongly his feeling on the wisdom of innovating an association committee to consider sanitary conditions in ice plants before adverse legislation can be passed.

A major address of the convention was presented by Joe W. Wright, sales manager Turner Electric Works of Jacksonville on the subject of Maintenance of Electric Equipment. Mr. Wright demonstrated with a model the simplicity in design of an electric motor which makes for greater efficiency. He enumerated the main troubles to be confronted in motor maintenance.

A. P. McIntosh of the department of industrial safety, Florida Industrial Commission, gave a talk on the relationship of accident rates and workmen's compensation insurance rates. With a colorful pictoral chart he explained the increase in workmen's compensation rates during the years 1948 to 1953 which showed that payments to accident victims had doubled in that time.

Geo. B. Bright, national known authority on refrigeration engineering gave an interesting talk on the ice business in 1953. Among other things, he said that sized ice appears now to offer the best possibilities of increasing ice sales.

Lee Gutierrez, manager of a large quick freeze, ice making, and storage plant in Biloxi, Miss., gave a talk on quick freezing of shrimp. Back in 1938, he said, some leading ice companies looking for a means to supplement their ice business became pioneer investors in shrimp freezing. Later he established an ice and freezing business, the Biloxi Ice Company, which has a capacity for freezing 55,000 pounds of shrimp in one day. He gave details as to size of room, size and type of freezing equipment, necessary man-power, etc., needed for operation of such a plant.

Hunter Lynde of Newman, Lynde & Associates, Advertising Agency of Jacksonville, talked on why it pays to advertise. Regarding the ice industry he said that with this highly acceptable product, excellent possibilities for expansion of business are to be found through research. The product he said should then be offered in new attractive forms and containers from attractive places of business.

Paul Smoak, public accountant, gave an interesting talk on how to determine costs in the manufacture and distribution of ice. His message pointed out the advantages of bookkeeping constituted to the needs and size of a business and such a system can keep the owner aware at all times of fact and figures on cost of operation and employee efficiency.

One of the highlights of the convention from the standpoint of general interest was the report by Representative Charley Bennett on the 83rd United States Congress. The chief accomplishments he said were economy in government and reorganization of departments in the National Government.

The formal part of the program was closed by an address by William T. Jobe, representing the National Association of Ice Industries. Mr. Jobe gave a review of the national organization and commented on the activities of the association including research and publicity.

The convention was brought to a fitting close with a luncheon in the Floridan Room of the hotel. Dr. Frank Goodwin of the University of Florida gave an entertaining talk in which he emphasized that the main problem of retail business men is that they have to deal with people who can be irritating, aggravating and frustrating.

Officers and Directors

Officers and directors for the coming year elected to office are:

President—J. S. Earman, Vero Beach.

Vice - President—D. W. Browne, Miami.

Officers and executive committee members Florida Ice Association. Seated: D. W. Browne, Vice-president; J. S. Earman, President; Herman Osteen, Treasurer; J. R. Gramling, past president. Standing: Guy W. Spearman, Jr.; L. E. Johnson, J. S. Ostner, S. C. Clark, R. A. David, Jack Whisnant and Jerome Johns.

Secretary—Miss Murial Washburn, Jacksonville.

Treasurer—Herman Osteen, Miami.

Directors: J. R. Gramling, Plant City; C. C. Baxter, Daytona Beach; Fred Carroll, Tallahassee; Jerome Johns, Starke; Jack Whisnant, Immokalee; L. E. Johnson, Marianna; J. S. Ostner, Jacksonville.

Engineer's Conference

A TWO-DAY fall engineers conference of the Southwestern Ice Manufacturers Association was held in Corpus Christi Oct. 28 and 29. About 100 ice plant managers and engineers attended the meeting. Guest speakers included well-known engineers of the industry in the state and representatives of plant equipment supply houses. The conference program centered around plant operating efficiencies.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Forty-Fourth Annual NAPRE Convention at Purdue Shows Growth and Progress

WHEN Alvis J. Clay, President, opened the 44th Convention, NAPRE, at Purdue on November 10, he left no doubt in the minds of delegates, visitors and guests that the theme of the meeting was to pay honor and respect to Professor H. G. Venemann. Mr. Clay pointed out that Purdue had always been a fine host, but the intention behind the out-of-season return of NAPRE to the campus was to comply with the Professor's request to be with him once more before he retired. Purdue retires Mr. Venemann at the end of the 1954 school year.

The annual meeting opened at noon, when General Convention Arrangements Chairman, Bert C. McKenna, Chicago, cut the tape leading to the exhibits in the South Ballroom. Mr. McKenna, the newly elected Board Chairman, NAPRE, described the exhibits as not only educational in nature, but an assurance of the financial success of the 44th Annual affair as well. For the Association he expressed individually to manufacturers of refrigeration equipment, accessories, and supplies, the thanks of the Association for their part in the show.

Welcome Address

Welcome to Purdue on behalf of the Regents of the University and the State of Indiana, was by Professor H. L. Solberg, Head of the School of Mechanical Engineering.

Professor Solberg pointed out the items in common between NAPRE and Purdue, pointing out the advantages of such meetings at regular intervals. His talk indicated that it was the plan of the University to retain Professor Venemann in limited status following his retirement and he expressed hope, that NAPRE would capitalize on the extended services which its National Educational Chairman could offer after June 1954. In closing he invited NAPRE to return to Purdue in 1958 to celebrate Professor Venemann's 75th birthday.

The response to Professor H. L. Solberg's welcome was delivered by Walter E. Bernd, past President, NAPRE. For the membership, Mr. Bernd expressed their appreciation for the opportunity of holding their annual meeting at Purdue University, and made mention of the splendid meeting that was held there in 1949. He said that opportunities of this kind were not often presented to the Association. The privilege of meeting with instructors in our universities who have the training and guiding of our young men in their hands, and who start our young people on such careers as they may choose, he felt was alone well worth the time spent at the university.

To Professor Venemann, Mr. Bernd expressed the appreciation of the NAPRE for the work that the Professor had done as Chairman of the Educational Committee. The membership knew, Mr. Bernd stated, that in his retirement, the Professor would get a great deal of satisfaction in looking back over his years at Purdue, and observing the success of the graduates of that university who had come under his guiding hand.

New Chapter Announced

Following this response, Mr. Clay introduced the national officers. Reports were made by the President on Association progress during 1953, by 1st Vice-President Leo J. Vivien on Membership-at-Large, and 2nd Vice-President, Regis Gubser, summed up chapter activities by announcing the formation of a new chapter at Green Bay, Wisc. J. Richard Kelahan, Secretary, summed up National Office activities, and touched on high points for the 1954 program. A financial statement was presented by Treasurer, Leland Kenagy, indicating increased income and expenses in proportion with increased membership.

National Committees reporting were Membership, Operating Data Book, Educational, Publicity and Public Relations, with Milton S. Rambo, Tom Weatherford, Professor Venemann, and S. Averill Cole, representing the committees, respectively. Erich Utescher, Chairman, Operating Data Book, was unavoidably absent and Mr. Weatherford reported for him. Functional Convention committees appointed by President Clay were

Resolutions — John T. Dabbs, St. Louis, Chairman, James Chaisson and John N. Mariakis, New Orleans, Falconer Anderson, Tacoma, Waino Minkkinen, Stockton, and George A. Koehne, Tulsa; Auditing—Bernard J. Mancuso, New Orleans, Chairman, Gene Kessler, St. Louis, L. G. Schroeder, Colton, E. H. Dupuy, Memphis, and Angus Casberg, Rio Grande; Credentials—Roy N. Burns, Detroit, Chairman, Henry G. Turner, Tulsa, C. M. Gerhart, Sacramento, Robert S. Harrison, Memphis, and Louis P. Mantz, Pittsburgh; Nominating—A. R. Carlson, Chicago, Chairman, E. T. Quinn, Los Angeles, and L. P. Mantz, Pittsburgh; George A. Koehne and Angus Casberg, alternates, replaced Howard H. Peterson, Yakima, and John J. Bryner, New Orleans, members of this committee who were absent.

Breakfast Session

On Thursday, November 12, a unique session was held. Delegates met at breakfast and listened to an address by Emmett T. Quinn, past President, and Treasurer, California Chapter No. 2, Los Angeles. Mr. Quinn's talk was inspirational. He related briefly the ups and downs of the National, elaborated on problems in Los Angeles' 30 chapter years, and gave out some advice to all

EXECUTIVE OFFICE, N A P R E
433 N. Waller Ave.,
Chicago 44, Ill.

OFFICERS
President, L. J. Vivien,
New Orleans 22.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, an educational association.

Fig. 1—President Alvis J. Clay opens annual meeting. Prof. Venemann, left, guest of honor, and Prof. Solberg, look on.

chapters based on his experiences both as a chapter officer, and as a national figure.

Membership Contest

Following this stimulating talk, W. R. Burnett, Membership Committee, announced the winners of the 1953 contest.

The Emerson Brandt Memorial Membership Trophy and the large chapter contest went to Louisiana Chapter No. 2. Second place in the large chapter contest was Los Angeles, and Chicago won the trophy for small chapters. Leroy Etzel, then chairman of the Board, NAPRE, presented the trophies to James Chaisson, President at New Orleans, to Wm. Ray Burnett, representing the Los Angeles Chapter, and to Bert C. McKenna, President of the Chicago chapter.

Fig. 2—George B. Bright, Detroit, presents Professor Venemann with gold watch and band as a token of appreciation from the members of NAPRE. Mrs. Venemann and Bert C. McKenna, Chairman, Board of Directors, watch the proceedings. Mr. Bright startled banquet attendants by dropping the first package onto the floor. The first gift parcel proved to be a dummy.

Resolutions Adopted

Among the resolutions adopted were quite a few expressing thanks and appreciation to those persons most instrumental to the success of the 44th meeting. Delegates expressed their thanks to Purdue University and the State of Indiana for the invitation to hold the convention on the campus, expressing their appreciation especially to Professor M. M. McClure, Assistant Director, Adult Education Division, to Lloyd M. Vallely, Manager, the Union Club, and to Keith S. Glancy, Conference Supervisor.

The delegates rose to give Mrs. H. G. Venemann their thanks in appreciation for her efforts in behalf of the ladies program. Resolutions also acknowledged appreciation of the lovely flowers at the convention presented through the courtesy of Mrs. J. H. H. Voss of New York. Expressions of appreciation were made in the resolutions adopted, recognizing the work of the Chicago and St. Louis chapters in entertaining the delegates and guests at the various socials. Efforts of the speakers and the financial assistance provided by the exhibitors were acknowledged. Appreciation of the efforts of the retiring officers was also mentioned. In conclusion of the business session delegates and guests stood in a moment of silent prayer for the 12 members who passed away during the previous year.

Annual Election

Election of Officers for 1954 took place on Thursday afternoon, November 12. Leo J. Vivien, Secretary, Louisiana Chapter No. 2, New Orleans, was unanimously elected President. Other officers elected were, Regis Gubser, Los Angeles, 1st Vice-President, Leroy Etzel, San Francisco, 2nd Vice-President, Leland Kenagy, Kansas City, Treasurer, and Tom Weatherford, Jr., Dallas, Sgt.-at-Arms.

Directors elected were Bert C. McKenna, Chicago, Chairman, R. A. O'Neill, Corpus Christi, H. A. Bran-

Fig. 3—Alvis J. Clay, left, is presented with a testimonial plaque by incoming President, Leo J. Vivien. Presentation was made at the annual banquet of NAPRE held on November 12 at Marshalls, Lafayette, Ind.

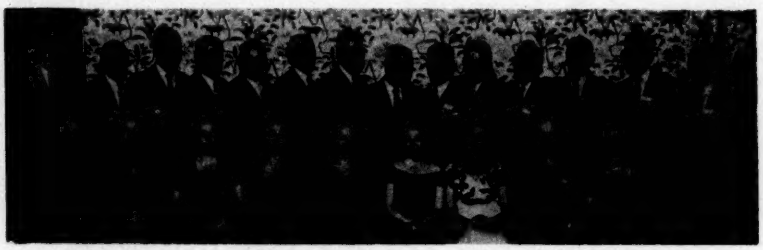

Fig. 4—Officers, directors and national committeemen and their wives photographed at the National Banquet. Seated, left to right, are Mesdames J. Richard Kelahan, Roy N. Burns, Frank L. Chase, Bert C. McKenna, Alvis J. Clay, Leo J. Vivien, Regis Gubser, H. G. Veneman, Leland Kenagy and R. A. O'Neill. Standing, left to right: Kelahan, Secretary; Burns, W. R. Burnett and Chase, Directors; McKenna, Board Chairman; Professor Venemann, Educational Chairman; Clay, Past President; Vivien, President; Gubser, Vice-President; Kenagy, Treasurer; O'Neill and H. B. Branham, Directors; Tom Weatherford, Jr., Sergeant-at-Arms and John T. Dabbs, Membership Chairman. Vice President, Leroy Etzel, was absent.

ham, Pocatello, Frank Chase, New Orleans, Wm. Ray Burnett, Los Angeles and Roy T. Burns, Detroit.

The Secretary, J. Richard Kelahan, Chicago, was reappointed by the Board of Directors.

Changes in Constitution

Among business items considered and carried by the delegates were a number of changes in the Constitution and By Laws. INDUSTRIAL REFRIGERATION was adopted as the Official Organ, replacing its antecedant, ICE AND REFRIGERATION.

Engineering Discussions

Engineering sessions included discussion of Insulation for low temperature applications, vapor barrier problems, safety, water treatment, pumps, lightning protection, physics, electric power, recent cold storage construction, refrigeration for meat processing, automatic refrigeration plants, cooling tower modification, and practical engineering economics.

In addition to the papers reviewed below, speakers included Geo. B. Bright, ASRE and NAPRE officers Regis Gubser and Bert C. McKenna. Members assisting with these sessions included Tom Weatherford, Dallas, Francis A. Yost, Pittsburgh, John H. Klass, San Francisco, Allen H. Cox, Toledo, and John W. Neff, Chicago.

D. H. Ruark, Mansfield, Ohio, a Purdue graduate, 1937, was a guest speaker. Other guest speakers were Ralph Epstein and A. J. Sander, Chicago, R. Starr Parker, Atlanta, Francis A. Yost, Pittsburgh, Jas. G. Macormack, New York, Wm. A. Schock, Midland, and E. C. "Bill" Ward, Chicago.

Socials Popular

The lighter side had its innings at the Convention. St. Louis Chapter, under the guiding hand of Chas. A. Wunderlich, entertained delegates, guests and families with an informal party at Marshall's Coffee Shop, Lafayette, on opening night. John Dabbs, President of the chapter, welcomed all hands.

While the delegates and gentlemen guests applied themselves to business and engineering sessions, followed by a stag buffet dinner, the lady guests spent the entire day, Wednesday, on a program of their own. At 11:00 a.m. the hour of the Armistice, World War I, a full dress rehearsal of the famous Purdue Glee club was held for their benefit. This was followed by a luncheon in the Chestnut Room, Purdue Memorial Union.

That afternoon a field trip through National Homes, Lafayette, was arranged. Here the home-makers saw production of pre-fabricated homes, with particular concentration on kitchen and bath arrangements. (Many ideas gained there were certain to overtake the next raise the refrigerating engineer might win.) The evening was spent at dinner in Lafayette at the Club Avalon.

Annual Banquet

The annual banquet was held at Marshall's, Thursday evening. Chicago Chapter, chairmanned by Wm. V. Richards, entertained with a cocktail party. Dinner entree was famed Indiana corn-fed roast beef. Professor H. G. Venemann, honored guest of the convention, made the address.

Chairman Bert C. McKenna, at request of retiring President, Alvis J. Clay, introduced Geo. B. Bright for a presentation. Mr. Bright in behalf of NAPRE presented Professor H. G. Venemann with an engraved Lord Elgin gold watch and band, as evidence of the respect and esteem with which he is held by the membership. Alfred M. Reilly, Chicago, toastmaster, led the assembly in a rousing expression of continued health and happiness for Mrs. Venemann and the Professor. Following this activity, a large cake with a candle for each year of his membership, plus ten taller colored candles, representing his years as Educational Chairman, was presented the Professor.

Retiring President, Alvis J. Clay was then presented with a parchment scroll attached under glass to a hand rubbed walnut placque, bearing testimony of his services and appreciation of the membership. President, Leo J. Vivien made the award, commenting in a humorous vein on events of the year. Dancing to the music of Ed Manczak and his Palmer House Orchestra, and refreshments through the courtesy of the Chicago Chapter, followed.

New Orleans Chapter Next Convention Host

At the last session, Friday, November 13, invitations were read from eight cities requesting that the 1954 convention be held in their localities. At a preferential ballot taken, the delegates voted to hold the convention in 1954 at New Orleans, La. Following the convention session, the board of directors met and confirmed the selection of New Orleans for the 45th meeting.

Review of Refrigeration Engineering Papers

Lightning Protective Measures

C. S. SPRAGUE
Purdue University

"ENTRANCE cable and especially the windings of rotating machinery are susceptible to lightning damage. Thus the problem of protecting such equipment may be of considerable importance in a refrigerating plant where continuity of power would seem to be quite essential.

"The magnitude of surges entering the plant may be limited by the use of overhead ground wires and by lightning arresters properly located on the outside line. Cables may be protected by lightning arresters at one or both ends. Lightning arresters at or close to the machine terminals will limit the magnitude of the voltage impressed on the windings. Turn-to-turn voltage stresses may be relieved by a capacitor connected at the machine terminals. Ground resistance should be made and kept of low value. Interconnection of grounded objects, structures, etc., will reduce the hazard and promote better functioning of the protective devices.

"The selection and application of suitable and economically practical protective methods are problems peculiar to the particular conditions. In other words, there is no general overall economic solution, applicable to all cases."

Down to Earth Physics

I. WALERSTEIN
Purdue University

"PHYSICS is the basic science for all engineering practice—refrigeration engineering not excepted," Professor Walerstein told the delegates. "The basic ideas of heat transfer thermodynamics, temperature measurements, etc., are obvious examples of physical instruments and principles which are constantly being employed in refrigeration devices. Less obvious, but nevertheless playing an important role in present day refrigeration engineering practice, are

numerous applications of important principles in mechanics, electricity, and even light and electromagnetic radiations," he related. "Newer discoveries in the field of physics may not be considered as directly applicable to this branch of engineering now, but the ingenious designer of new types of equipment may be able to recognize in these newer findings certain potentialities for his own field." To aid such workers, several fields of physics, old and new, were discussed by the aid of a series of demonstration experiments. The logic of these experiments was presented, without detailed mathematical formulation, but were analyzed as illustrative of a few basic fundamental principles. "In some cases the careful analysis, even if only qualitative in nature," the physicist said, "will lead to results totally unsuspected on the basis of first impressions."

Selection of Pumps for Refrigeration Service

A. R. SPALDING
E. I. Du Pont de Nemours

THE major uses of pumps in refrigerating plants, pump classification and their characteristics were discussed briefly. Types of pumps generally encountered in refrigeration were covered in enough detail to show why they are applicable. Some fluid system conditions and the selection of the proper pumps were analyzed with emphasis on operating versus investment costs. Pump materials and the problem of corrosion were surveyed briefly.

Water Treatment Problems of Refrigerating Engineers

K. M. HOLADAY, Anheuser-Busch, Inc.

THIS is not a report of new discovery, nor a description of original experiments, but rather a review of methods developed within the industry over a period of years for controlling water conditions in three areas of operation: (a) commercial ice making, (b) condenser cooling, and (c) brine making.

Eight ways to relieve white ice and cracking problems in the ice plant were discussed: deaeration, agitation, multiple coring, annealing, lime softening, neutralization, additives, and demineralization. A new factor in the problem of brittle ice has been introduced in some localities where fluoridation of the public water supply is practiced. Only very small quantities are involved, about 1 ppm of fluoride, but it appears that this constituent results in a marked increase in the brittleness of ice. Recommended remedies are (a) application of an additive containing ammonium ions, or (b) demineralization by ion exchange which will remove the fluoride along with other ions.

Chromate treatment was recommended for water to be used in making brine. Where there is no chance of contaminating food products, a polyphosphate treatment was indicated as preferable. For controlling scale formation and corrosion in cooling water systems, small dosages of a polyphosphate were suggested. Where conditions are favorable to the development of algae and slime organisms which foul cooling water systems, several effective methods of treatment were recommended.

Automatic Refrigeration Operation

LEON BUEHLER, JR.
Vice President, ASRE

AUTOMATIC control depends upon the ability to sense a change in some governing phenomenon such as temperature pressure or speed. This measured change can be used to actuate a mechanism such as turning on lights, opening a door and closing a valve. It may even actuate a mechanism to return the changed phenomenon to normal such as in con-

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trolling the temperature of a cold storage room.

In addition to the measuring or controlling device, an operating mechanism is also needed although usually only the automatic instrument is thought of. For successful automatic control, consideration must be given to the instrument, to the nature of the disturbing forces and to the nature of the mechanism being controlled in order to develop a successful system. Examples were drawn from dairy plant applications.

Eliminating Electric Power Problems

D. H. RUARK, Mansfield, Ohio

THE proper selection and application of electric motors in refrigerating plants can eliminate many operating and maintenance problems. Electric motors are built in many types and with many kinds of inherent characteristics. The right motor on the job is important, according to the speaker. Selecting the proper motor was discussed in detail.

In the second part of his talk, the speaker related how in the past two years many changes have been made in the construction of large high speed motors. Many of these changes are of definite interest to operating and maintenance people, as they make large high speed motors much easier to maintain and repair. Many of these new features were shown on slides and explained in detail.

Practical Engineering Economics

C. T. BAKER, Consulting Engineer

THIS article discusses the theories of good business practices as they apply to the engineering field. The engineer has a two-fold obligation in planning and designing a project. He must first know his business as an engineer, seeing to it that the owner's money is invested in sound equipment and that he will be assured of a profit from its operation—assuming, of course, that it will be properly maintained. Second, while the Plant Engineer may have no say in the matter of cost accounting methods, he should be well informed in the basic economics of plant operation and the costs of production—whether a ton of ice or a kilowatt hour of electricity.

He should know what should be charged to Capital Account and what to Operating Expense—how depreciation and taxes are figured. Knowledge of this sort will disprove the charge that the engineer knows very little about the value of a dollar—that he seems to think management invests in almost any project just to provide employment.

An Operating Engineer and Cooling Tower Design

WALTER E. BERND, Washington, D. C.

AT the Friday morning session, Walter E. Bernd, vice-president and supervising engineer of the Terminal Refrigerating and Warehousing Corporation, Washington, D. C. delivered a paper on the construction and re-design of a bank of cooling towers which were in operation at the Terminal Refrigerating Company's No. 2 plant in Washington.

He reviewed many problems that were encountered in this redesign work and showed the difficulties in taking air temperatures and volumes in tower tests. A number of lantern slides were shown describing in detail the construction design and the final results obtained in this rather radical kind of cooling tower equipment, and in conclusion made certain recommendations as to how the results obtained in Washington could be improved on if another installation were attempted.

Refrigerating Problems of Meat Packing Plants

R. STARR PARKER, Atlanta, Ga.

THIS paper discussed the design and operating conditions which must be met to provide temperatures necessary to the processing, preservation, and transportation of meat and meat products.

Refrigeration demands of the meat packing industry range through carcass cooling, product chilling, freezing and storage, ice manufacture, and refrigerating transport equipment.

In some instances, the author relates, as in carcass chilling, high air velocity and certain amount of moisture pickup is desirable. In others, such as sausage storage rooms, rapid air movement and moisture pickup must be avoided almost at any cost. Blast chilling and freezing, he related, is coming into increasing use in this industry along with unit ice makers of very sizeable capacity. Equipment for maintaining lowered temperatures in refrigerating motor trucks for local and long distance meat deliveries is rapidly becoming an important part of the meat plant refrigerating engineer's responsibility.

Good Housekeeping for Engineers

O. D. LASCOE, Purdue University

SINCE good planning, organizing and advance arrangements are an asset to higher productivity, good housekeeping becomes one of our main factors leading to preventive maintenance and higher degree of accomplishments.

Considerations must be given to: planning and layout of work areas, planning and scheduling work assignments, storage places for tools and materials, floor finishes, color and lighting, service charts, and lubrication maintenance. Inspection tours of the machine tool laboratory, tool cribs and material storage, foundry laboratory, and general shop laboratory served the speaker for spotlighting specific points of the lecture.

Environmental Alteration in Animal Production

F. N. ANDREWS, Purdue University

IT is generally agreed by Agricultural and Engineering authorities that temperature, light, moisture, air movement, altitude and various radiations have a profound effect on plants, animals and man. Nearly every economic aspect of plant and animal agriculture, crop yields and composition, animal growth, reproduction, milk production, egg production, and the efficiency of conversion of feedstuffs to economic units, is influenced by the climatic environment, the speaker related.

There is an optimum environment for nearly every agricultural product, he continued. Some of the climatic requirements are known, and appear too complex to be manipulated by man. In some instances minor alterations of temperature, light or moisture result in significant economic gains. In many instances, however, the lecturer indicated, optimum environmental requirements are unknown. The purpose of the Purdue research program in environmental physiology is to determine the environmental limitations in animal production and to attempt to modify them by the application of sound management, physiological and engineering principles, including refrigeration and air conditioning.

New Ideas In Cold Storage Construction

RALPH EPSTEIN, Architect, Chicago

ACCORDING to this speaker, U. S. commerce is witnessing a rapid expansion in cold storage space. Six of seven structures designed and erected by his organization were one story, a discernable trend. Numerous advantages of this construction with regard to maintenance and plant transportation were made apparent.

Author selected Mid-South Cold Storage as an example, and proceeded to discuss its prefab tilt-up construction, unique insulation method and materials, and two stage refrigerating plant utilizing both high speed VW type and rotary compressors. A chart was utilized on a screen to compare 10 most important features of the seven plants. These plants were: Continental Freezers of Illinois, Inc., and Stock Yards Packing Co., Chicago; Snow, Ice and Per-

mafrost Research Establishment, Wilmette; Mid-South Refrigerated Warehouse Co., Memphis; Chanute and O'Hara Field Air Fore Bases, both in Illinois; and U. S. Cold Storage Co., Omaha.

This Engineer Shortage, and the Refrigeration Industry

H. G. VENEMANN,
Purdue University

INDUSTRY in the United States is faced with serious dangers in the years ahead because of an acute shortage of technical engineers. This shortage estimated at 60,000 will become greater for several years. About 30,000 graduates from engineering colleges are required each year for replacements and growth. In 1952 there were only 25,000 and in 1954 the number is expected to drop to 12,000 graduates.

The refrigeration industry is not getting its fair share of the few who are graduating, because it is not going after them with the inducements that are being offered by other industries. This shortcage will be reflected all down the line, so that the training of operating personnel in the years ahead will fall more heavily upon the shoulders of experienced operators currently employed. The refrigeration industry must learn that the National Association of Practical Refrigerating Engineers, through its educational program, is doing an excellent job of developing operating engineers, and that it could do an even better job if it had greater support from the industry and machinery manufacturers.

Air and Vapor Mixtures, and Migration Problems

WILLIAM T. MILLER,
Purdue University

ATMOSPHERE is described as a mixture of dry air and water vapor, and the mechanical properties of this mixture are discussed in this paper. The usual observed phenomena are discussed, and the term "permeance" is defined. The discussion points out the fact that no standard procedure has been adopted for determining permeance of materials. Vapor pressure differentials, it is pointed out, provide the "head" for water vapor migration. Three causes for these differentials are given and four solutions are suggested.

The migratory behavior of free moisture in a material is practically impossible to anticipate, the speaker said. He cautioned against confusing vapor proofing with water proofing.

News Notes and Chapter Activies

Los Angeles

FRED HERR

LOS ANGELES Chapter has started a movement to get the 1955 convention of NAPRE in Southern California. The first step was taken at the November 4 meeting after National Past-President E. T. Quinn pointed out that in the normal sequence of events, Regis Gubser, now national vice-president, will move into the presidency in 1955. Mr. Quinn said it would be a fine tribute to an outstanding refrigeration man if the national convention were in Los Angeles that year. A committee was appointed to enlist the collaboration of the Chamber of Commerce and hotel associations.

The speaker at the November 4 meeting was William E. Osborn, safety engineer, California Consumers Corp., presenting a talk on safety in the refrigeration industry. His preliminary discussion involved presentation and demonstrations of various safety devices and mechanisms. This was followed by suggestions on how employees and employers alike can cooperate to the achievement of better safety records in refrigeration plants. The third item on the Osborn program was a film on plant safety which had been produced by the Crystal Ice Company, Sacramento, Calif., in its own plant and using company personnel in the cast.

Treasurer Quinn submitted a report on the Ham-and-Beans dinner revealing a neat profit for the chapter treasury. New members initiated at this meeting were Arthur Dietrich, Jersey Maid Milk Co. and Don F. Green, Union Ice Co. Don Byl's name appeared on both applications as the sponsor, resulting in his winning the first prize offered for the 1954-55 campaign.

The October 21 meeting featured a talk by Cyrus Otterholm of the Richard Dawson Company on the selection and operation of evaporating condensers and cooling towers. Chairman W. R. Burnett, membership committee, presented the final figures on the chapter's effort in the 1953-54 membership drive: total, 43 new members, of which 23 were garnered by the Independents Team and 20 by the Calif. Consumers-Union Ice team. As a result Burnett enjoyed a steak dinner at the expense of Don Byl. Byl, however, had the last word, when Burnett presented him with a very useful prize for bringing in ten new members during the campaign just ended.

President Frank Muzzy appointed a nominating committee of Rudie Kettler, Regis Gubser, Don Byl and W. R. Burnett. A field trip to the Shell Company's new ammonia plant, Ventura, Calif., scheduled for November 18, had to be cancelled since the plant was not ready for visitors. A visit to Pacific Cold Storage Co.'s plant, Vernon, was substituted.

Emmett T. Quinn reported on his trip to Mexico at an earlier meeting. He related that their trip was by air to Mexico City, a visit to Heathen Monument of Tenayoca, the Catholic Shrine of Guadalupe and the pyramids of the Sun and Moon. The trip would not have been successful our treasurer related, if he had not investigated the refrigeration industry. Mexico does have considerable commercial and domestic refrigeration equipment and large fleets of refrigerated trucks. He saw several air conditioning installations at Acapulco. Mexico City is too mild a climate for much air conditioning, he reported. Quick freezing plants, outside of fisheries, would not be successful locally because farmers have crops the year round.

New Orleans

LEO J. VIVIEN

DURING September, Charles Parker, engineer, Minneapolis Honeywell Controls Co., completed a series of lectures on automatic controls. This series has helped the members understand the complexities of this type of equipment. A very interesting meeting was held on Refrigerating Plants—Operation and Maintenance. This session was conducted somewhat similar to the national convention method. A panel comprised of Leo Vivien as Moderator, Frank Chase, Chief Engineer, Hibernia Bank Bldg., W. Lane, York Corp., B. J. Mancuso, Chief Engineer, Pelican Ice & Cold Storage Co. Inc., and A. E. Wegener, Chief Engineer, Crystal Ice Co., was bombarded with many interesting problems and held sway for over an hour.

At the first meeting of October, J. M. Jolley, Sales Engineer, Chase Brass Co., through the cooperation of the Standard Brass Company, delivered a lecture on the use of brass in refrigerating plants, and showed a color-sound film on manufacturing brass and copper. This meeting was further enlivened when Henry Schmidt and Charlie Anderson were presented a letter from President Alvis J. Clay of commendation and

(Continued on page 51)

President James Chaisson presenting letters of commendation to Chas. Anderson, left and Henry Schmidt, center.

NAPRE
Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

Efficiency Terms

QUESTION No. 971: What is the difference between the terms compression efficiency, mechanical efficiency, and adiabatic efficiency of a compressor?

ANSWER: The equations for the three efficiencies will, no doubt, show up their differences:

Compression eff. = thp/ihp
Mechanical eff. = ihp/bhp
Adiabatic eff. = thp/bhp

In the above equations *thp*, frequently known as tihp, is the *theoretical horsepower*, or the power required to pump a certain weight of refrigerant at constant entropy.

The *ihp* is the *indicated horsepower*. This is the actual power required in the cylinder by the piston to draw in the refrigerant, compress and expel it—so called because an indicator card must be taken to obtain the mean effective pressure in the cylinder.

The *bhp* is *brake horsepower*, or the power required at the shaft or fly wheel, and is equal to the ihp plus the friction hp.

Examples Previously Published

Many examples of the magnitude of these three horsepowers and efficiencies have been published. See Table VI, page 84, REFRIGERATION THEORY AND APPLICATIONS: In test No. 24 the *thp* was 60.1, the *ihp* was 74.5 and the *bhp* was 83.5. Therefore, the compression efficiency was 80.6 percent, the mechanical efficiency was 89.2 percent, and the adiabatic efficiency was 71.9 percent. (The term adiabatic efficiency is used in the ASRE Data Book, Basic Volume, page 37, 7th edition, in connection with the performance of vertical two cylinder ammonia compressors, similar to Table III, page 81 of R. T. AND A.)

This discussion is the result of an argument over a statement which occurs on page 304 of the NAPRE lecture course by Guy King. Under *Compression Horsepower* this statement is made: "Therefore, the real horsepower is very close to theoretical figure." Here it is shown that there is considerable difference between the actual *ihp* and the *thp*, and a much greater difference between the *bhp* and the *thp*.—H. G. Venemann.

Lowest Temperature

QUESTION No. 972: What is the lowest temperature that man has attained and how did he attain it?

ANSWER: At present the lowest temperature ever attained is within a fraction of one degree above absolute zero, which is minus 459.7 degrees Fahrenheit. This was achieved by evaporating liquid helium under a vacuum, then by adiabatic demagnetization of the electrons of a paramagnetic salt. Research scientists claim that, if the nuclei were lined up in a magnetic field of 100 kilo-gauss, and then thermally isolated before removing the magnetic field, temperatures of the order of 0.00001 K or lower would be obtainable.—Y. S. Touloukian.

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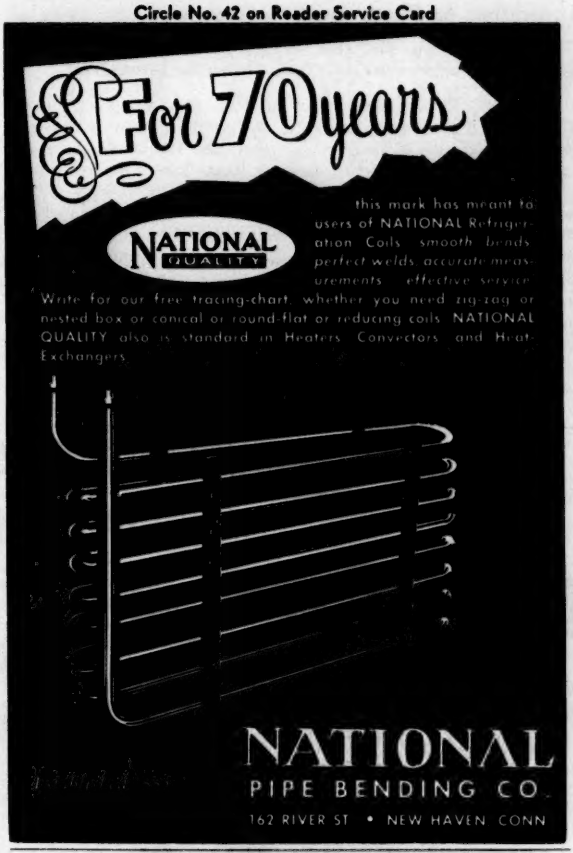
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Insulation to Block Heat

QUESTION No. 973: Can enough insulation be applied to a surface to prevent heat from following through it?

ANSWER: Theoretically not enough insulation can be applied to a surface to entirely prevent heat flow if there is a temperature difference between the two sides. Insulation merely retards the flow of heat. The over-all coefficient of heat transfer gives us the rate of flow in Btu per hour, per square foot, per degree F of temperature difference. The greater the thickness, the smaller the overall coefficient. It would cost too much money to reduce the heat flow to a negligible amount. So the decisions as to the thickness of insulation to use becomes a matter of economics in which the cost of removing the heat which flows into the refrigerated space must be less than the cost of the insulation, including its investment cost, its maintenance, etc.—H. G. Venemann.

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New Questions

CFM vs Ton Ratings

QUESTION No. 974: For rotary type compressors, refrigeration applications, why can't we purchase these units based on cfm rather than refrigeration tonnage rates?—J.R.F.

Relation of Cylinder Diameter To Wall Surface

QUESTION No. 975: A rotary compressor manufacturer states that they try to keep the diameter of the cylinder small and run to larger lengths in order to provide greater heat transfer surface through the cylinder wall. This compressor is jacketed and uses an oil coolant. It appears to me that it should be the other way around; that is, the larger the diameter, and the shorter the length of this rotary compressor cylinder, the greater the wall surface. How can I prove this? Mathematically, how can I satisfy myself as to who is correct? —R.F.K.

Ice Storage Construction

QUESTION No. 976. What improvements have been made in the design of rooms or buildings for storing ice to be used on passenger trains? What modern materials are applicable in construction of such facilities? Explain.—M.H.D.

Fractional Hp Motor Headache

QUESTION No. 977. I have a 1/6 hp Delco, 120 v, one phase motor, belt-driving the compressor on a Kelvinator in the Boss' office. This motor is a rebuilt job, the second in as many years. The motor starts across the line and apparently has some sort of starting winding built in, for the brush rigging is movable and appears to energize a portion of the motor on starting, then moves to another position on running.

Now this motor is beginning to act up. When the thermo-switch cuts it across the line, it dims all the lighting in the office to the point where I think sure the fuses will blow, then clears up and repeats at least two more times before humming right along normally.

The refrigeration system is in first class shape and the box holds temperatures. I think I'm about to lose my third motor and don't know why. Any suggestions?—F.L.B.

Freon-Oil Affinity

QUESTION No. 978. I understand that Freon 12 has great affinity for oil. What maximum oil concentration (percent) can be expected in a system at 40 F evaporating temperature, at 0 F, and at minus 30 F? Any information available on oil pickup in other freon gases?—A.J.B.

Practical Fire Extinguisher

QUESTION No. 979. What mix should I use of salt and water in fire barrels provided in addition to hand extinguishers? I have been assigned the task of refilling these barrels—M.F.M.

News Notes and Chapter Activities

(Continued from page 48)

recognition for 30 years of continuous membership in Louisiana Chapter No. 2. Pictures were taken of the honored members and they in turn held the interest of the group with stories of their experiences during the many years of active membership in our Association. Max Sofer, membership chairman, and his committee was commended on the fine work done during the year in securing over 50 new members for our chapter.

At the second meeting of October instruction was resumed on the Guy King Refrigeration Course, Chapter 15, entitled "Servicing." Unable to obtain the services of Professor A. M. Hill as instructor this year, due to press of duties at Tulane University, John Luck, a member who has much experience in design, operation, and maintenance of refrigerating equipment, assumed the title of Professor and conducted his first lecture on the course. His unique method of open discussion on personal problems of servicing proved very instructive and interesting.

The chapter is sorry to announce that Philip Genovese, a member for many years, has passed on to his reward. Bro. Genovese was chief engineer of La Louisiane Restaurant and St. Regis Cafeteria; a humble and capable engineer. May his soul rest in peace.

Chicago

JOHN FORTI

FIRST meeting of September featured L. J. Rudolph, general superintendent, Central Cold Storage Company, long experienced in cold storage work. He spoke on the preservation of food as a tie-in with the chapter in the refrigeration course. Maintaining proper humidities for storage of shell eggs caused considerable discussion. Onion storage and frozen candies also attracted interest of the engineers and warehousemen present.

At the meeting, Tuesday, October 27, Buildice Manufacturing Co. played host to Chicago Chapter with a fine array of food and drinks at their plant, 2610 South Shields Avenue, Chicago. A. Hulke, chief engineer, elaborated on all types of equipment manufactured by Buildice Co., high and low pressure receivers, horizontal and vertical shell and tube condensers, suction traps, intercoolers, finned pipe coils, and various types and sizes of air units.

After the discussions, John Hienzelman, Jr., led the members on a tour through their shop. Several machines were put into operation to show members how refrigeration equipment is manufactured. Center of attraction was the welding of seams and flanges on a large condenser with an automatic welding machine. Hydraulic pipe benders and electric butt welders were shown making pipe coils for air units.

St. Louis

KEN HOLADAY

NOBODY bothered to count how many pigs it took to furnish ribs for the St. Louis Chapter barbecue and family party October 3. The Baden VFW picnic ground was full of busy and noisy NAPRE people all afternoon. As Entertainment Chairman, Ed Lotte was the busiest person, and maybe the noisiest, what with supervising the ribs and beans, and calling the bingo numbers. Gene Bishop furnished music from his inexhaustible supply of records for the dancing members of the party. Prizes were donated by Al Loeffel, Thermal Engineering Co., J. Lange Holke, Carl F. Gast Co., and Harry Crall, Star Iron Works.

How to judge what's wrong with a pump without taking it apart, how to figure tonnage of a cooling water system, and pumping and power requirements, and how to avoid the hazards of underlubrication or overlubrication were some of the practical questions discussed by R. C. Kahdeman, NAPRE member and pump specialist, Charles S. Lewis & Company, St. Louis pump manufacturers. Mr. Kahdeman talked at the meeting, October 19, in the library of David Ranken School of Mechanical Trades.

The principal business considered at the meeting was the selection of national convention delegates. John Dabbs, Ken Holaday, Gene Kessler, Al Loeffel, Ed Lotte, Jack McCarthy and Gurdon Uplinger were named to represent the chapter at the Purdue meeting.

The NAPRE study course is being presented by a competent pair of instructors, alternating as leaders for the educational meetings. Erwin Menzenwerth, Chief Operating Engineer, East St. Louis plant, Swift & Company, led off the season with a lesson on operating principles. Herman O. Mehmken, Industrial Sales Engineer, York Corporation, followed with a lesson on servicing refrigeration plant equipment.

Seattle

JIM BENNETT

AT THE September meeting, the following engineers were elected and initiated as active members: Robert S. Harrison, Sicks' Seattle Brewing & Malting Company; Lester J. Tisher, City Ice and Cold Storage; Earl E. Dolin, Seattle Packing Company. We have lost a good member in Vince Kauffman who leaves Seattle to go with Baker Engineering Company at Los Angeles.

President Chet Bertus and first vice-president Floyd Burris, engineered the coffee making for the Seattle Chapter's July picnic.

At the November 4 meeting member Robert Harison, design engineer for Sicks' Seattle Brewing & Malting Co. was the featured speaker. His subject matter covered sodium and calcium-chloride, brines, the making of such brine, treatment and special brine probiems arising in the brewing industry, as well as difficulties caused by different water in various parts of the country. Special treatment was given to the subject in connection with stainless steel.

Dallas

HAROLD KOUTNIK

ON SEPTEMBER 21, Dallas Chapter held its regular meeting in the auditorium, Alford's Refrigerated Warehouse. L. P. Reiss, engineer consultant, presented the first instruction of the Fall season. At the October 5 meeting, there was an open discussion of the problems facing both machinists and operators in industrial refrigeration. Pete Bancock presided. On October 19, F. B. Riek, Jr., discussed ways and means of increasing membership. He also gave a very interesting account of his recent trip to Europe. The meeting was concluded with the showing of movies, courtesy of Alco Valve Co.

Memphis

CHARLES CONLEY

FOR the meeting, Wednesday, October 7, H. L. Todd, the Chapter's instructor lectured on the Guy King course covering instruments on meters. Mr. Todd had with him various types of thermometers, recording, indicating, remote bulb, separate socket types and pressure gauges of various types.

At the October 21 meeting, held at the regular location, Hotel Chisca, the Chapter's instructor took up the subject of Heat Circulation. He explained how the heat load of a cold storage room was reduced by the use of various thickness of insulation, how profitable it was to insulate, the thickness that would be a good investment, and exhibited several samples of various kinds of insulation.

Pittsburgh

OTTO KNOCH

THIS chapter met out of season on October 5 with the National Secretary, who made a trip into this area to tell about National Convention plans. The turn-out for this meeting was a huge success, and the overflow crowd had to be handled in an adjacent room. Several applications for new memberships were received at this meeting, thus giving us a few more points in the membership contest. After presenting the national program, the Secretary answered questions from the floor on national matters, educational program, publicity and the like. Louis Mantz, our president, a past national president, will be our delegate to the National Convention.

Members-at-Large

Leroy Etzel

ACTIVE and associate members recently elected to membership-at-large status by the National Board of Directors were: Allen W. Cox, Manager, Low Temperature Insulation Sales, Owens Corning Fiberglas Corp., Toledo; Daniel T. O'Neil, Supervising Engineer, Narragansett Brewing Company, Cranston, R. I.; Edward J. Nelson, Assistant Plant Manager, Pacific Fruit Express Company, Pocatello; Phongse Dibivadi, Fisheries Department, Bangkok, Thailand (Siam); William Gretz III, Vice President, Production, William Gretz Brewing Company, Philadelphia; F. F. French, Maintenance Chief Engineer, Westbank Co-op Growers Association, Westbank, British Columbia.

Other members-at-large heard from recently were Harry D. Jefferson, Hawaiian Pineapple Company, Ltd., Honolulu, who expressed his regrets at being unable to attend this year's convention; Leslie Steggel, Upminster, Essex, England, who commented very favorably on the change of name to Industrial Refrigeration, and who pointed out how much he appreciates receiving this monthly publication and the educational course; and P. K. Sarkar, with Alliance Engineering Company, Singapore (Malaya), who tells us that he has been elected corresponding member of the International Institute of Refrigeration. Congratulations to member Sarkar.

Rio Grande Valley

ARMIN F. DONEIS

THE question session of the previous meeting was continued on September 29 with discussion of badly worn bronze sprocket wheels. It was concluded that the deterioration was probably due to wear in the ice-chain resulting in a change in chain pitch and consequent riding of the chain near or even over the tooth tips. Discussion of construction, purpose, use and abuse of demand-meters was next. Included was consideration of the time-element and scheduling of large-motor operation to avoid heavy penalties from excessive demands over short periods. R. A. O'Neill, a national director, NAPRE, was appointed official delegate from the chapter to the national convention at Purdue. Angus Casberg, a national past president, will also attend.

Colton

HARRY BONTER

THE meetings of September 9 and October 14 were held in the Santa-Fe Ice plant lunch room. It appeared that national ball games, fights and vacation time kept a lot of the members from attending the meetings the past two months. Members that have attended the meetings regularly enjoyed the lecture course on refrigeration, the round table discussions and the lunch that follows the meetings.

An attendance committee was appointed to contact all members and arouse a greater interest in attending the meetings. The committee will attempt to show that refrigeration is not only one of the largest industries but one of the greatest benefits in our life today and there is a lot to learn about it.

Green Bay

JIM SCHOUTEN

THIRD of a series of meetings toward chapter formation was held on October 21. The national secretary, Dick Kelahan, was again present and reviewed the history of NAPRE briefly for more membership prospects present. He highlighted present day activities and educational benefits of membership.

Bert C. McKenna, Chief Engineer, Central Cold Storage Co., Chicago, was our guest speaker. At this group's earlier request, he discussed conversion of his Dearborn St. plant's cooler space to freezer storage. Insulation, finned cast aluminum pipe coils, brine circulation, defrosting, and plant capacity all came into a share of the discussion.

Harvey Wishart, Larsen Co., was appointed chairman (protem) of the Program Committee by President (protem) Amos Vierbecker. Chas. Culbert, Burge Ice Machines, Al and Chas. Bassett, Bassett Refrigeration, and Milt Noel, manufacturers representative, were named members.

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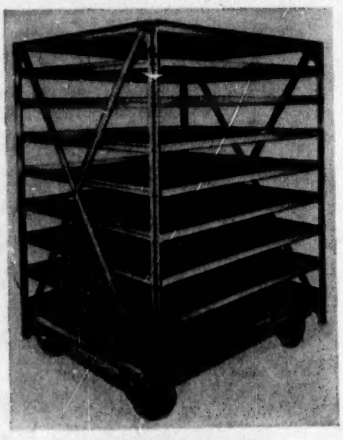

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Research Shows Car Icing Saves Potatoes

ACCORDING to "Agricultural Research" issued by the Agricultural Research Administration, U. S. Dept. of Agriculture, transit research is paying off for California early-potato growers, who shipped nearly three-fourths of the 1953 crop under modified icing. Scientists have found this not only saves as much as $30 to $40 per car but also gets potatoes to eastern markets in far better condition.

These findings are welcomed, too, by wholesalers, retailers, and housewives, who get a large part of their early potatoes from California. Until this year, too many of these potatoes spoiled at the market.

To find a way to stop this waste, scientists of the Bureau of Plant Industry, Soils, and Agricultural Engineering and the California Agricultural Experiment Station made a series of transit tests.

In four seasons they crossed the continent with 43 carloads of potatoes, making detailed studies of temperatures, icing services, and equipment, to learn how these variables affected the potatoes. The test results told the story.

California early potatoes, grown in fertile soil with plenty of moisture, are usually harvested in late spring before they have matured. These potatoes skin easily. Sometimes they lose nearly all the coat that protects them from spoilage.

Icing Provides Protection

Decay thrives about 75 to 80 F but at temperatures of 65 to 70 F the potatoes can develop a replacement cover that holds in moisture and keeps out spoilage organisms. This healing process slows down at 50 F, however, and it will stop if temperatures drop to as low as 40 F.

Thus, early potatoes shipped long distances under heavy icing can't grow new protective tissue. They look bright when unloaded and would be all right if they were kept cold. But after a few days of wholesale handling and retail display, all without refrigeration, they're in trouble. Shriveling, surface browning, and decay develop.

The four-year study led to these recommendations for keeping potatoes cool enough to avoid decay but warm enough to promote healing:

1. For early-season potatoes with average temperatures below 70 F when loaded: half-stage icing after loading, plus one re-icing on the fourth or fifth day in transit. (In half-stage icing, grates are raised half-way up in car bunkers and only half a load of ice is used.)

2. For warmer weather, when potato temperatures run 70 to 75 F: half-stage initial icing, after loading and re-icing on the third and seventh days in transit.

3. For moderately warm weather, with potatoes at 75 to 80 F when loaded: full-bunker icing after loading and one re-icing on the third or fourth day in transit.

4. For hot weather, when potatoes are at 80 F or higher: pre-iced, full-bunker cars and re-icing twice in transit. Pre-cooling cars to about 55 F may be advisable. If half-stage cars are used, re-icing should be done at regular stops.

New England Ice Association Fall Meeting

THE Fall meeting of the New England Ice Association was held October 13. The New England Locker Association was represented with the attendance of their secretary and two other members of the group.

As several members of the association are tied in with the locker industry, representatives of the New England Locker group were invited to discuss a possible combination of the two associations. Mr. Daniels, secretary of the Locker Association outlined the situation and expressed the belief that his group would be interested in further exploration of such a consolidation. Mr. Pond, president of the New Hampshire Association, spoke for his group and invited the secretary and any other interested parties to attend a meeting of his group to be held in Manchester October 29. Both associations agreed to appoint a committee to work out the details of a possible working arrangement between the two groups.

Roy L. Sparks, general manager of the Ice Carvings Company, Hollywood, Calif. gave a very interesting talk on punch bowls and molded carvings. He demonstrated the use of molds and explained how these can be delivered on a no call-back basis.

Following luncheon the session was reconvened on a forum basis with the following subjects scheduled for discussion: Vending stations, Dealer contracts, Automatic bag weighing and tying, Meat and poultry icing, Diversification, Past season's business, Engineering subjects.

Refrigeration Safety Division Plans Program

AN informal meeting of the Ice, Cold Storage and Locker Plant Division of the National Safety Council was held the afternoon of October 21, in connection with the National Safety Congress at the Morrison Hotel, Chicago. W. F. Leonard, Jr., Chairman of the division, discussed some results of the past year's work and outlined the program for the coming year. He was assisted by Sloan Childers, vice-chairman.

A concentrated drive will be made during the coming year to enlist new members from the ice, cold storage and locker industries in this division of the National Safety Council. Plans also have been formulated to collect and report monthly accident information on all accidents including personal injuries and vehicle accidents. It is believed that if this plan is successful this information will go a long way toward keeping business concerns informed on the origins of accidents and enable them to more definitely formulate plans for reducing accidents.

Another activity on which considerable stress will be placed during the coming year is the promotion of safety parades in smaller towns, and this will include the presentation of safety float in other civic parades.

Mr. Leonard announced that H. T. McDermott, publisher of INDUSTRIAL REFRIGERATION has accepted the position of Secretary of the Division.

Frozen Green Peas

THE 1953 pack of Frozen Green Peas reached a total of 226,032,-115 pounds, according to a preliminary tabulation by the National Association of Frozen Food Packers. This total was a new record high, nearly 11 percent greater than the 1952 pack.

Regional totals indicated an important increase over the 1952 pack in the East, a moderate increase in the West, and a slight drop in the Midwest. The Western pack of 166,-336,546 pounds was the greatest total ever recorded for that region.

In container size usage, the trend to the 10 oz. retail size continued strong this year, with nearly all of the retail pack going into that size. The use of the 12 oz. size continued declining, so that less than 4 million pounds was packed in that size.

The total volume packed in small institutional sizes declined a little this year, while the volume going into large bulk sizes—30 lb., 50 lb., 55 lb., etc. showed a substantial increase.

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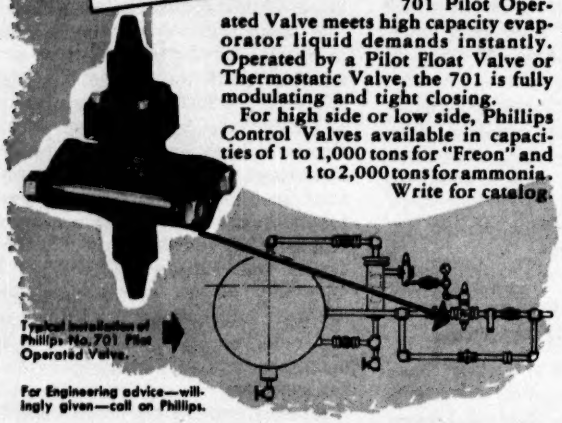

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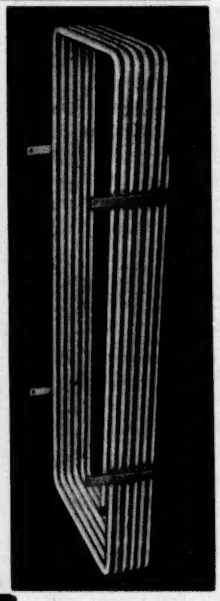

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New Ice Plant in New Mexico

CONSTRUCTION has started on an ice and cold storage plant at Las Cruces, New Mexico, to cost $80,000 according to Sam Norris, Jr., of El Paso, who will be the plant manager. Owners of the plant will be Norris, Tony Passero, and Jack Holcomb. Holcomb and Norris own the City Ice Co. at Truth or Consequences. The firm also will operate the Silver City Ice Co. in Silver City after November 15.

Mr. Norris said the new plant here will be able to manufacture 30 tons of ice a day. The pumice block building will be 100 feet by 100 feet. An ice vault and dock will be built first and the company will begin to sell ice brought in from Truth or Consequences or Silver City about January 1. The plant will ice produce trucks as well as sell block and crushed ice locally. It will also sell distilled water, charcoal, milk, soft drinks and melons and frozen foods.

Canadian Refrigerator Production

CANADIAN factories turned out fewer refrigerators for home use in August than in the same month last year, but in the first eight months of this year production was substantially above 1952 levels, the Dominion Bureau of Statistics reports. Factory shipments were also down in the month and up in the eight months, while month-end stocks were appreciably higher this year.

Output of domestic-type electric refrigerators, exclusive of home and farm freezers, dropped to 18,149 this August as compared with 23,898 in August last year, while the January-August production totalled 203,525, a gain of 51 per cent over the corresponding 1952 total of 134,524. Factory shipments fell to 14,835 from 22,720 in the month, but totalled 211,198 against 171,711 in the eight months. Stocks on hand at the end of August were about three times greater this year at 26,918 against 8,922.

Fire Damages Ice Plant

CONSIDERABLE damage resulted from a fire in the storage vault of the Southern Ice Company Plant, Dallas, Texas. The fire started near a loading chute, about 30 feet up on the 50-foot walls of the vault and spread upward through insulation to the roof. No estimate on the loss was available, but it was said to be heavy.

Pipe Line in Toronto

CITY Council of Toronto, Canada has approved laying refrigeration piping in the new Toronto East Arena Gardens and installation of a pipeline to the Lake Simcoe Ice & Fuel Co., Ltd., at a total estimated cost of $25,625. The city will apply to the Ontario Municipal Board for approval of capital expenditure. Approval was given a contract with Lake Simcoe Ice & Fuel, Ltd., to supply the required refrigeration at a cost to the city of $1,250 per month, five months per year, for ten years.

Milk Frozen at Home

IN RESPONSE to questions from owners of home freezers, USDA dairy specialists are saying that homogenized milk in paraffined-cardboard containers can be frozen successfully and held about a month. The paperboard bulges out and there is enough headspace to prevent breakage of the seal. Zero is recommended, as storage temperature.—TRRF Information Bulletin.

Dormant Nursery Stock Damaged by Ethylene

STUDIES by O. F. Curtis, Jr., and D. R. Rodney at New York Agricultural Experiment Station, Geneva, N. Y., have shown that very small quantities of ethylene, in the neighborhood of one part per million, can cause serious harm to dormant nursery stock of apple or pear and perhaps other species at cold-storage temperatures. Damage consists of soft callus-like outgrowths in the bark, loss of buds and death of the plants. Pears are particularly susceptible. Damage required about two months at 35 F and concentration of ethylene up to about 10 parts per million does not seem to alter time of exposure required for damage. Temperature does have an effect on rate of development. At temperaturs above 35 F, the damage develops much faster; in fact, seven times as fast at 55 F as at 35 F.

For this reason, it would be well to be sure that no fruits like apples and pears and moldy oranges (sound ones apparently do not, at least at cooler temperatures) are near nursery stock, as they produce ethylene in ripening. Precise knowledge on how much ethylene is given off by orange mold is presently unavailable. It is known, however, that fruits vary in amount of ethylene they give off and also that nursery stock of some species does not show the damage described above. The need for caution and care, however, is apparent, as well as the need for continued study.

In the case first brought to the attention of Curtis and Rodney, the only source of ethylene seemed to be an apple room on the other side of an apparently well insulated wall.—TRRF Information Bulletin.

Frozen Concentrate Shows Big Jump in Consumption

CONCENTRATORS are really going to demand a chunk of the citrus production total this season, according to news reports, if consumption of frozen orange juice so far this year is an indication.

The Market Research Corporation of America reported Americans purchased 1,073,000 gallons of frozen juice during the week ending October 3 for a mark of six percent higher than the consumption rate a year previous. That total also brought the year's record to 42,085,000 gallons despite prices averaging 2.6 cents higher than last year for the average six-ounce can. The figure was amazingly high in view of the higher price and was just another indication of the growing popularity of the product.

Consumption of other types of single strength juice also increased, with single strength orange juice selling 305,000 cases strong, compared with the 291,000 cases sold a week earlier. That 305,000-case figure, based on an average case of 24 No. 2 cans, left consumption totals down 27 per cent from last year for the same period, with a six-cent price increase probably the cause for the drop. The average 46-ounce can of single strength orange juice brought 32.8 cents for the week ending October 3, MRCA found.

Grapefruit juice sales increased amazingly, with 243,000 cases sold. That figure was almost identical to the sales total for the same period a year ago, despite prices an even two cents higher for the average 46-ounce can.

Even blended juice moved back into prominence, with 87,000 cases sold, 21,000 more than the previous week. The price of 31.6 cents for the average 46-ounce can was 4.8 cents higher than last year at that time. Market research figures are compiled for the commission, from a sampling of 4300 families checked by MRCA. They do not represent actual sales totals.

Circle No. 30 on Reader Service Card

How New STERLING KOOLER KUBES® Save TIME-TROUBLE-MONEY

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Mr. Louis M. Levit, Cross Bros. Secretary, says Kooler Kubes maintain even brine strength, keep machines working more efficiently with lower labor costs, then adds:

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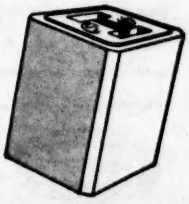

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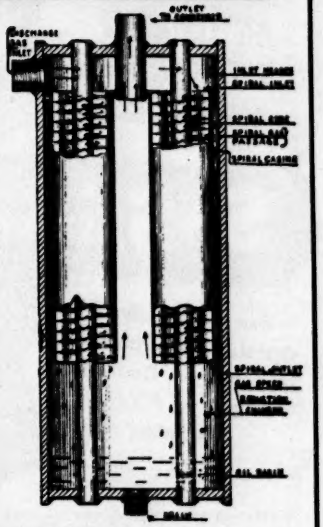

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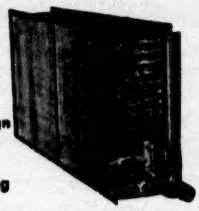

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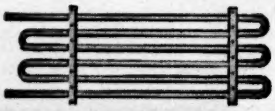

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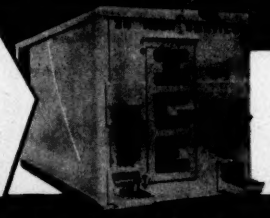

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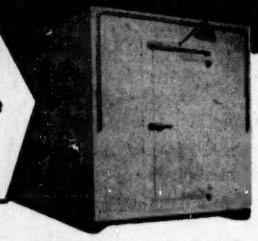

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Frozen Foods Convention To Show Prepared Foods

AN UNPRECEDENTED four-day session at which every group concerned with the marketing of frozen foods will jointly discuss mutual problems has been announced by M. K. Spiegel, president, Spiegel Farms, Salinas, Calif., and president, National Association of Frozen Food Packers. The convention, which will be held under the auspices of the National Association Frozen Food Packers will take place at the Hotel Commodore, New York, January 31 to February 3, inclusive.

"The handling and marketing of frozen foods has many aspects which are entirely different from those of foods preserved by other methods," Mr. Spiegel said. "The packers want to invite food brokers, distributors, super-market and chain store operators, executives of cooperatives and voluntary buying groups, and independent retailers to listen to our problems and to tell us about theirs.

"As packers, we believe we can offer considerable help to other groups within our industry. This help can increase sales and reduce costs. However, we are constantly learning, too, and we believe that our guests who deal directly with the consumer will provide us with a great deal of practical information and workable improvements for our present techniques," Mr. Spiegel said.

One of the major features of the convention will be "The Greatest Frozen Food Show on Earth," the first frozen food sampling display ever presented. It will feature prepared and specialty foods exclusively. This aspect of the frozen food field now accounts for one-third of total retail sales and is growing rapidly. Booths will be arranged in circus-style, with heating and serving facilities available, to permit sampling of a wide variety of frozen foods.

Among topics to be discussed at separate sessions will be such questions as size and weight of packages, physical handling and marking of goods at retail, grading market research, methods of display, trends in distribution, design of packages, personnel and store-operating methods, warehousing, product procurement, and a number of others.

Pakistan Harbor Improves Refrigeration Facilities

WORK will soon start on a modern fishing harbor at Karashi, Pakistan, which will bring increased production and up-to-date methods to the city's oldest industry. Since early times there has been a fishing village where the capital of Pakistan now stands and the fishermen still use the same type of boats and nets and the same methods as have been used for centuries.

The new harbor, for which the Technical Co-Operation Administration of the U.S.A. is to advance $750,000 will be self-contained, self sufficient fishing center. It will include a wholesale market, which will help insure that fish reaches the consumer fresh. There will also be a cold storage building and an ice plant. The Government intends setting up refrigerating units throughout the country and improving transport, so that fresh fish can reach the districts.

The harbor will handle about 350 fishing vessels and will provide facilities for the building, maintenance and repair of mechanized boats. Mechanization of the fishing fleet is one of the most important projects that the Fisheries Department has planned and when complete it is expected to increase the yield by at least 30 percent. The department's immediate aim is the mechanization of 800 large and 300 small boats beginning in West Pakistan and spreading to East Pakistan later.

October 31 Cold Storage Holdings

PUBLIC cooler occupancy reached 70 percent by October 31, a gain of 5 points over the previous month's occupancy. While this increase was greater than last year, it was only about equal to the 5-year average change for this time of year. In all likelihood public cooler occupancy is now at its highest level for 1953. Freezer occupancy also reflected a seasonal gain during October and by the end of the month it had increased to 80 percent. This compares with 78 percent last year and 76 percent on October 31 in the 5-year period.

Warehouse reports for the month ended October 31 indicated a total of almost 28 million bushels of apples in storage. Last year less than 27 million bushels were on hand while 29 million bushels were average for this time of year.

A greater than average net accumulation of frozen fruits brought national stores up to 388 million pounds which represented a new post-war high for October 31.

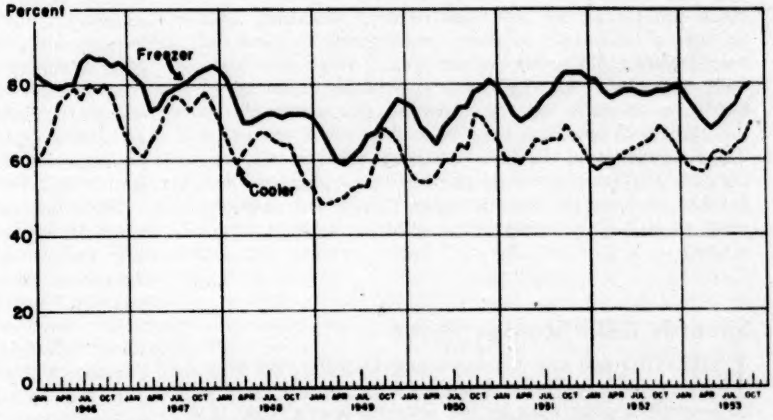
Frozen vegetables stocks reached a new record high on October 31 with 734 million pounds.

National stores of creamery butter were reduced 19 million pounds during October and by the end of the month totaled 304 million pounds. Above average net withdrawals of cheese (15 million vs 11 million) left 445 million pounds on hand October 31, of which almost 413 million pounds were American Cheddar.

Only 277,000 cases of shell eggs were in store on October 31 as compared with one million last year and 843,000 on October 31 in the 5-year period ended 1952.

Frozen egg stocks were reduced to less than 87 million pounds by the end of October as net withdrawals during the month totaled 23 million pounds.

All classes of poultry reflected net storage gains during October — the largest being 54 million pounds in turkey stocks. With almost 124 million pounds of turkey in storage, the poultry industry carries into the holiday season the second largest quantity of turkeys ever reported on October 31.



END OF MONTH OCCUPANCY OF PUBLIC COLD-STORAGE WAREHOUSES, 1946-53

Stores of frozen beef were increased by 28 million pounds during October to total 166 million pounds by the end of the month. This compares with 189 million last year and average holdings for October 31 of 105 million pounds. Frozen pork stocks fell off during the month to 82 million pounds—a reduction of 16 million pounds. Total pork holdings — 179 million pounds—were more than 20 percent under last year's stocks and average October 31 stores.

The peak in public cooler utilization was undoubtedly reached on October 31 with a reported occupancy of 70 percent. During November a reduction of as much as two points is expected if the 5-year average pattern prevails. Utilization of freezer space has not yet reached its peak for according to previous performance a gain of one point is expected by November 30. An occupancy gain of as much as two points may be realized.

TABLE 1—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	Oct. 1953	Sept. 1953	Oct. 1952	Five Year Average
Beef	174,519	146,843	198,104	114,993
Pork	178,974	200,597	234,894	228,752
Other Meats & Meat Products	110,862	112,717	123,830	98,934
Frozen poultry, lbs.	257,544	176,385	279,191	224,650
Creamery butter, lbs.	304,359	323,077	102,177	126,649
American cheese, lbs.	412,537	426,383	225,317	217,036
Other cheese, lbs.	21,953	23,818	19,866	22,091
Shell eggs, cases	277	494	1,000	843
Frozen eggs, lbs.	86,752	109,869	95,333	117,394
Apples, bu.	27,588	7,887	26,892	29,471
Frozen fruits, lbs.	388,155	373,522	326,459	338,720
Frozen vegetables, lbs.	734,377	688,353	576,522	457,583
Frozen fish, lbs.	179,871	174,640	200,944	168,620

TABLE 2—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC REFRIGERATED WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu ft)		Oct. 1953 (%)		Sept. 1953 (%)		Oct. 1952 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,149	7,284	50	81	47	74	45	77	59	78
Middle Atlantic	29,154	35,621	73	83	64	82	72	86	69	82
East North Central	26,901	25,274	72	88	73	87	70	83	72	77
West North Central	11,178	21,342	67	74	65	75	64	62	72	70
South Atlantic	10,307	13,466	65	67	59	62	69	67	62	74
East South Central	2,486	4,191	85	80	83	78	79	86	79	84
West South Central	5,009	5,593	59	76	61	72	64	59	60	57
Mountain	1,167	3,085	64	72	46	68	73	81	66	73
Pacific	15,772	29,597	69	82	61	81	73	84	67	80
United States	105,123	145,453	70	80	65	79	69	78	68	76

New Cold Storage Plant in Austrian City

IN THE near future, according to a news report, one of the largest cold-storage plants in Central Europe is to be built in the free-port area of Linz of Upper Austria on the Danube River. The installation, which will cost some twenty million shillings, will be built with private capital. Credits for the project have already been obtained.

The announcement of plans to build a cold-storage plant immediately gave rise to an offer by a group of Danish exporters, who indicated their willingness to equip the plant with the most modern machinery and to store a large part of their food exports in Linz for deep-freezing. Thus, the surface area of the plant, originally planned to be 43,000 sq. ft., will be expanded to 64,500 sq. ft. Later on, the operation and ownership of the plant will be taken over by a joint-stock company. The construction of the big cold-storage plant in the free-port of Linz has already given rise to new plans for expansion of facilities. Among other things, the development of a big food processing industry is being considered.

Spanish Cold Storage Plant

FREEZING and cold frozen storage facilities will soon be available in Cadiz, Spain, with the completion of a large modern plant built by the Instituto Nacional de Industria in cooperation with the Consorcio de la Zona Franca de Cadiz. The plant will be operated by the Spanish government corporation Industrias Gaditanas del Frio Industrial, S.A. (IGFISA).

The new plant is a 5-story building, 30 meters high, coveering an area of 2,400 square meters, providing a storage capacity of 3,600 metric tons by weight or 9,000 square meters by volume. It has cold storage space to be kept at a temperature of 4 C and frozen storage space at minus 18 C. There is also an ice factory with a potential daily production of 75 metric tons and an ice storage space of 1,100 metric tons.

While it is anticipated that the plant will be utilized largely for freezing and storing fish for subsequent export, it is also intended as a storage and freezing area for meat, eggs, fruits and vegetables. The management reportedly plans to rent storage space at an established rate per ton and per length of storage period, and will rent either entire rooms for the exclusive use of individual customers, or smaller compartments in other rooms to those requiring less space.

Since the Zona Franca or Free Zone is part owner of the plant, it is thought that it will be possible for all kinds of food products to be brought to Cadiz for freezing or for cold or frozen storage and to be re-exported from Spain without being subject to Spanish customs formalities. Similarly, customs arrangements for importation into Spain probably could be completed after the goods have been brought into the plant, processed, and stored.

Russia Transports Live Fish

RUSSIA has adopted a novel method of relieving its severe shortage of railroad refrigeration cars. According to the official government newspaper *Izvestia*, a new-type all-metal railroad car designed for transportation of live fish has been placed in production at the Bezhitsa locomotive factory near Bryansk. Each car has two tanks with a capacity of seven tons of fish. An experimental car is said to have passed all tests successfully. It delivered live fish from the Caspian, Baltic and Black Seas to markets in Moscow.

Plant Maintenance Show and Conference

MANY of the conference sessions at the Plant Maintenance and Engineering Show which will be held in Chicago, January 25-28, will have special interest for those in the air conditioning and refrigeration fields, it was announced by Clapp & Poliak, Inc., producers of the show and the Plant Maintenance and Engineering Conference which will run at the same time.

Hudreds of new products, especially useful to those interested in maintenance of air conditioning and refrigeration equipment, will be on display in the booths. The exposition will take place at the International Amphitheatre while the conference will be held at the Hotel Conrad Hilton.

Forty-nine conference sessions are scheduled. Among those of special interest are maintenance of mechanical service equipment, maintenance of electronic control equipment, "Electrical Distribution Systems," "Corrosion," "Lubrication," and "Plant Buildings."

There will be special sessions on "Planning and Scheduling Maintenance Work," "Maintenance Cost Control and Budgeting," "Preventive Maintenance," "Training People for Maintenance Work," "Organizing People, Policies and Procedures for Effective Maintenance," "Sanitation," "Work Measurement, Work Standards and Incentives." "Getting Management's Okay on the Maintenance Program," "Maintenance Labor," "Hospitals, Medical Departments and First Aid Rooms," "Card Record and Analysis Systems," and "Waste Disposal."

Particular types of equipment to get special attention will be materials handling, lighting and power plant and electronic control equipment. Other topics are "Methods of Handling in Maintenance Work." "Stores and Storekeeping." "Maintenance in Plants Having Up to 25 Employees," and "Janitor Work."

New Standards for Orange Juice

REVISED and new grade standards for concentrated orange juice have been announced by the United States Department of Agriculture. Grades for canned (processed by heat) concentrated orange juice are a revision of those which have been in effect since August, 1943. Grades for concentrated orange juice for manufacturing are new grade-standards.

New Precooling Plant

PLANS for a $200,000 vacuum precooling plant have been announced by the Shippers Ice Company, El Centro, Calif. Thomas B. Henderson, head of Shippers Ice said a railroad siding will be included to serve 34 refrigerator cars at one time.

COMING CONVENTIONS

NATIONAL FROZEN FOOD MERCHANDISING CONVENTION AND EXPOSITION
February 21-25, 1954
Waldorf-Astoria Hotel, New York, N. Y.
WILLIAM W. WALSH, Chairman convention committee

NORTH CAROLINA ICE ASSOCIATION
March 8-9, 1954
Sir Walter Raleigh Hotel, Raleigh, N. C.
LEWIS W. POWELL, Secy.-Treas.

NATIONAL ASSOCIATION FROZEN FOOD PACKERS
January 31-February 3, 1954
Hotel Commodore, New York, N. Y.
M. K. SPIEGEL, President.

Freezing and Storage of Bakery Products

EXPLORATORY investigations of certain fundamental questions about freezing bakery products is to be initiated soon at the Western Regional Research Laboratory in Albany, California, under the direction of Dr. W. D. Maclay in cooperation with The Refrigeration Research Foundation. This initial study, it is said, may well lead to a comprehensive research, as one phase of the investigation for the increased utilization of wheat, activated by the US Bureau of Agricultural and Industrial Chemistry.

Director H. C. Diehl of TRRF and Dr. George Garnatz, Director of the Kroger Food Foundation and chairman of the Baking Industry Advisory Committee, joined earlier this year in action designed to bring about such investigations. At the annual meeting of the foundation in May, 1953, one of the guest speakers, Dr. George Garnatz emphasized that the present need for research on freezing of baked goods is very great. While no detailed data are available, he said that estimates of returned stale bread alone indicate that it would be sufficient to provide bread for a city the size of Philadelphia if it were collected from the entire country. Moderate-sized companies, he said, have paid as much as $200,000 per year in premium rates for overtime and holiday time of workers, and the baking industry faces immediately a five-day week.

Use of Bread Declines

One of the major problems of American agriculture arises from the fact that consumption of bread and other wheat products per capita has been steadily declining over a period of years. It is a fact that much of our farming area is well suited to the production of wheat, in fact, better suited to wheat production than to any other crop. The apparent answer to that problem is advancement of research and industrial development that will enable us to use our abundant supplies of wheat more efficiently and more appropriately.

The whole question of a research program, according to those in charge, is complex and will require considerable study some of it basic in nature. Many practical problems face the baking company that considers freezing and frozen storage. Here are some examples: What is the best and most economical method for freezing bread? Should bread be frozen before or after it is packaged and before or after it is sliced? Are there any other limitations, such as type of icing used on certain goods, type of custards used and so on? Comprehensive technical information must be developed to supplement existing knowledge and to remove some of the conflicting ideas that are held presently. There is hope that by freezing bread, the much more palatable type, resembling more closely home-baked bread, will be feasible in distribution if material costs permit such formulation.

The question arises, can steps be taken now to develop the commercial storage of bread and other baked goods? So far, as success in preserving quality is concerned, the answer seems to be definitely in the affirmative. Refrigerated warehouses and bakeries have proved already the feasibility of freezing these products. Problems have arisen with icings and fillings and, therefore, the experimental approach is definitely recommended. Advice has been given to the effect that for prevention of staling in bread, either hard freezing or fairly high temperature is best—that is, cool temperature above the freezing range accelerates staling. Thus, it would seem that freezing preserves not only the quality that is present and that freezing very soon after baking is advisable.

Economic Problems

The major problems at present appear to be the economic ones. Can the baker prevent losses from leftovers or from high labor costs by freezing a portion of his production? Can a refrigerated warehouse provide the kind of facilities and service that will aid the baker? Some baked products have a comparatively low density and mutually equitable freezing and storage costs may present a difficult problem to the two industries involved. It would seem that, if this type of business is to be developed, it must first be considered in many local situations. Meanwhile, investigations of basic technical and scientific factors, looking toward large-scale development, will be very important and desirable. Hence, the urgency of the technical research program now to be begun.—TRRF Information Bulletin.

Vacuum Precooling Vegetables

(Continued from page 14)

Rapid Precooling. For commodities that lend themselves to vacuum-precooling this process is very rapid. the speed being limited principally by the design of the equipment. Prepackaged spinach, cole slaw, and mixed salad is being precooled commercially within 20 minutes. Using experimental equipment prepackaged spinach has been cooled from 70 to 32F in 6 minutes.

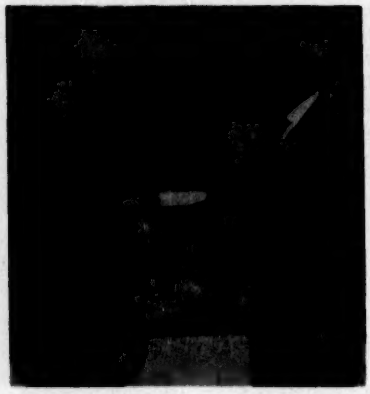
Other Advantages for the Prepackager. The quick cooling obtained by vacuum-cooling is beneficial in prolonging storage and market life. This may permit spinach and other perishable produce to be packed during week days, vacuum-cooled and placed in cold storage for short periods, thereby eliminating the need to pack on Sundays, holidays and during nights when handling and labor costs may be higher. When supplies of leafy vegetables used for prepackaging are in excess of demand, they may be vacuum-precooled in their original bulk containers and held in cold storage until the demand for prepackaged produce is resumed. In addition, it has been shown that the greater the amount of water removed by extraction (centrifugation) from leaves of spinach prior to bagging, the fewer the number of spoilage organisms present on the leaves and the longer the shelf-life of the bagged spinach. While there is no experimental evidence on the point it is believed possible that the additional moisture removed during the vacuum treatment may lengthen to some extent the period of salability of prepackaged produce.

Summary

Prepackaged spinach, cole slaw and mixed salad are being successfully vacuum-precooled at present under commercial conditions. With the addition of bagged ice it has been found practical to market prepackaged spinach, cole slaw and mixed salad during hot weather. The evidence indicates that any commodity, such as asparagus, sweet corn, leeks, brussels sprouts, and mushrooms, which it may be possible to vacuum-precool efficiently in bulk, could be successfully precooled when prepackaged.

News of PEOPLE

OTTO P. HELLER, secretary of The Creamery Package Mfg. Company, celebrated his Fiftieth Anniversary with the company on October 23, 1953. Mr. Heller was the guest of honor at a luncheon given by the CP Board of Directors at the Union League Club in Chicago.



E. B. Lehrack, left, President and General Manager, Creamery Package Mfg. Co., congratulates Otto P. Heller, Secretary, upon completing fifty years with the CP organization.

"Otto," as he is known to his many friends in the dairy industry, started with CP when he was 19 years old. By 1913 Mr. Heller became the Manager of CP's Refrigerating Machinery Department. In 1931 he became Director of Sales Service for Creamery Package and in 1947 he was appointed Secretary of the company, a position which he holds today.

Mr. Heller's devotion to his vocation was likewise reflected in his avocation which included many and varied activities. He is a 32nd degree Mason, a member of the Medinah Temple Shrine and a member of the Red Cross of Constantine. He is also on the Board of Trustees of the Ravenswood Hospital, Chicago, and a Ruling Elder of the Albany Park Presbyterian Church of Chicago. He is a life member of the American Society of Refrigerating Engineers.

F. P. SEBASTIAN, sales manager of the Southern Ice Company, Dallas, Texas, and a former president of the East Dallas Kiwanis Club, was elected lieutenant governor for Kiwanis Division 2, a four-county area including Dallas. Sebastian's election came at a Houston meeting of Kiwanis Club members from Texas and Oklahoma.

A. JAMES HACKI has been named by the Trane Company, La Crosse, Wis., manufacturer of air conditioning, heating and ventilating equipment, as manager of its Dallas, Texas sales office.

HOBART C. RAMSEY, president of Worthington Corporation, recently received the bronze "Oscar of Industry" trophy for the best corporation annual report of the year in the air conditioning industry, from Weston Smith, executive vice-president of "Financial World", sponsor of the

Hobart C. Ramsey (left) receives Bronze "Oscar of Industry" Award.

contest. Worhtington's report was picked by a committee of experts as best of those entries from the air conditioning field. With accumulated experience of nearly 50 years in manufacturing industrial and residential air conditioning equipment, Worthington has air conditioned the White House, the Mellon Art Gallery in Washington, the C.B.S. Television Center in Hollywood, the Consolidated Aircraft Plant in Fort Worth, and many other famous buildings.

S. ART MATTHEWS of 175 Piedmont Rd., manager of the cold storage department of the Federal Cold Storage Co., Columbus, O., retired Thursday, October 15, after completing 50 years in the cold storage business, 40 of which have been with Federal. Mr. Matthews was the guest of honor at a dinner held at the Meadow Brook Inn. More than 30 associates attended. Frank Holters, manager of the City Products, presided. During the dinner he was presented with a watch, the gift of his associates. He expects to retire and "take it easy" from now on.

Tom Raffensperger, who has been assistant manager of the cold storage department, will succeed Mr. Matthews as manager.

JOHN BAER, president of Baer Bros. Refrigerated Warehouse, Hagerstown, Md., was elected president of the Produce Prepackaging Association at its annual meeting in St. Louis.

FRANK A. LOZIER, Netcong, New Jersey, retired ice retailer died October 29, after a long illness. He was 74 and had lived in Netcong more than 30 years. He operated the Lozier & Sons Ice Company from 1922 until he retired last July.

DEATHS

Leo A. Berger

LEO A. BERGER, general sales manager of Beatrice Foods Co., died November 11 in Billings Hospital at the age of 54, following a brief illness. Mr. Berger had been associated with the company for nearly 30 years.

Mr. Berger was born in Chicago August 27, 1899 and spent his entire life here. He joined Beatrice Foods as a salesman on a horse and wagon route in the Hyde Park district in 1924. He became city sales manager in 1941 and was promoted to assistant general sales manager in 1945. In 1948 he was made general sales manager.

Mr. Berger is survived by his widow Esther, his two daughters, Marilyn and Mrs. Rosalyn Friedman and by five brothers and one sister.

Sir Edmund Vestey

Sir Edmund Vestey, age 87 years, died in London November 19. Sir Edmund, with his brother, the late Lord Vestey, built up the Union International Company Ltd., a frozen meat business, and the Blue Star Shipping Line. They developed Union International into Britains largest and richest meat and refrigeration organization. The Vesteys owned 500,000 head of cattle and controlled a chain of 2500 retail butcher shops.

Joe Murphy

EIGHTY-SIX year old Joe Murphy, life-long resident of Toledo, Ohio, died November 14. Mr. Murphy was one of the founders of the Citizens Ice Co. at the turn of the century, and in 1906 composed the song "We Are Strong for Toledo" and was the organizer of the Ice House Quartet.

JOHN S. COULTER, merchandising manager of the Serv-Ice Delivery Company, Akron, Ohio, died September 4 in City Hospital following a lingering illness. He had been a resident of Akron for 56 years, and had been connected with the ice company of that city for the past 20 years. Mr. Coulter was well known to members of the Ohio ice industry, having been a regular attendant at association meetings over a long period of years. A niece, Mrs. Lloyd Mertz of New York City, is his only survivor.

SIGFRIED K. HERZOG SR., age 80, founder of the first certified dairy in Marin County and also the Marin County Ice Co., Calif., died November 4.

MANUFACTURERS' NEWS

Worthington To Conduct Service Meetings

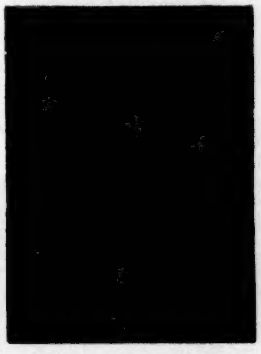
PLANS for a series of ten air conditioning and refrigerating equipment service meetings in ten cities have been announced by Worthington Corporation. The service meetings will present an opportunity for Worthington organizations to provide an educational program for their personnel.

The programs will offer an extensive coverage of essential information pertaining to the installation and servicing of various types of equipment. This coverage is designed to be of interest and value to all personnel with advanced or limited experience in all divisions of a distributors organization. New Worthington air conditioning and refrigerating products will also be discussed.

The first meeting will be held for service managers and will take place at Worthington's Holyoke (Mass.) Works on December 14 to December 18. Subsequent field service meetings will be held in New York, Washington, Atlanta, New Orleans, Kansas City, Los Angeles, Seattle, Chicago and Cleveland. Each meeting will be a two-day session.

Eastling New Link-Belt Manager Pacific Division

THE appointment of Harvey V. Eastling as general manager of the company's Pacific Division, with headquarters in San Francisco is announced by Link-Belt Company. He succeeds Ralph M. Hoffman, who is



Harvey V. Eastling

retiring after 40 years of service. The Pacific Division serves Western industry with a broad line of conveying, processing and power transmission machinery, with plants in San Francisco, Los Angeles and Seattle and district offices and factory branch stores in those cities and in Portland, Spokane, Oakland and Salt Lake City.

More Vending Stations

AN INCREASING number of vending stations for distributing prepared ice are being reported by ice and other companies. During the past thirty days, the following S & S vending stations have been installed at the following points:

Clanton, Ala., Clanton Ice Co.

Alhambra, Calif., Belle Ice Service.

Jacksonville, Fla., City Products Corp.

Wichita, Kansas, Steffens Dairy Foods, Inc.

Columbus, Ohio, City Products Corp.

Dayton, Ohio, City Products Corp.

Holland, Texas, Allen's Ice Co.

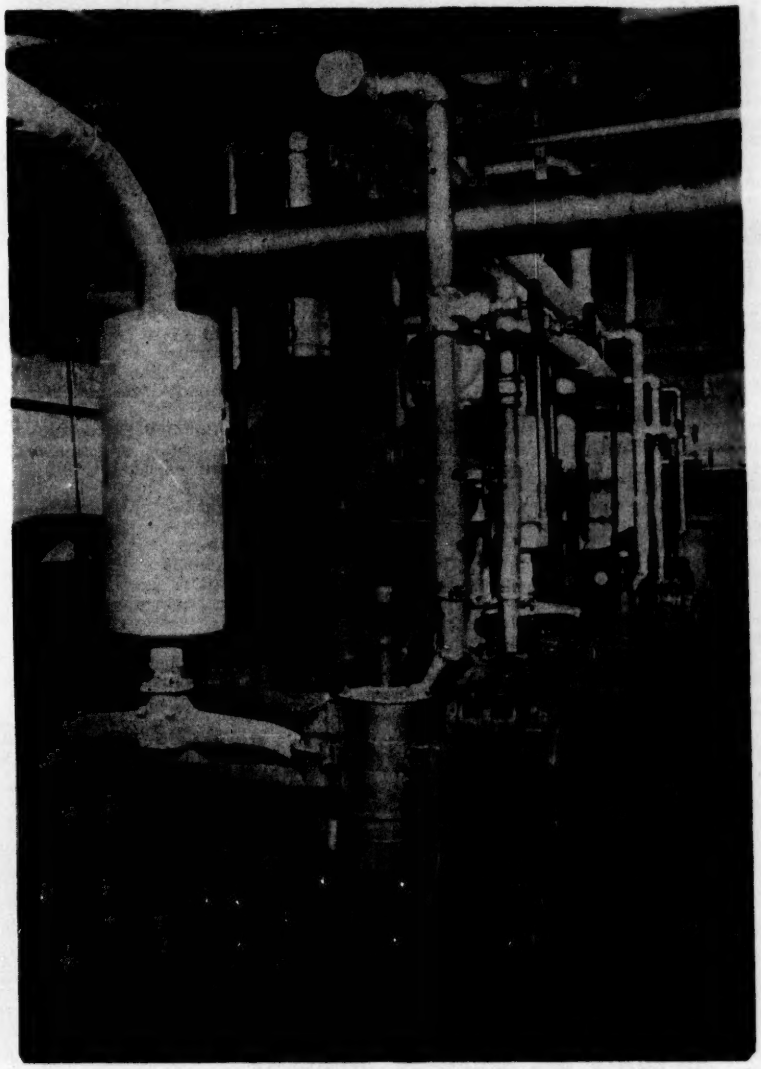
Los Altos, Calif., Los Altos Poultry Co.

Fresno, Calif., Currie Bros.

Buildice Appointment

THE appointment of Lawrence L. Arbuckle as Manufacturer's Representative to handle the states of Mississippi, Louisiana, Alabama, Georgia and Florida is announced by Buildice Company, Inc. Chicago, Ill. Mr. Arbuckle is an engineer of many years experience in ammonia, freon and heat exchange applications. He is a member of the ASRE, ASH & VE, and ASME and carries an Illinois professional engineer's license. His headquarters will be at Springhill, Alabama, a suburb of Mobile.

Diesel Engines Furnish Power for Ammonia Compressors



Three Caterpillar Diesel D4400 engines furnish power for the ammonia compressors at the Carnation Milk Company plant in Seymour, Mo.

CATALOGS AND BULLETINS

Unicon Application Manual

AN important new tool for the refrigeration industry, a "Unicon Application Manual V-250" has been issued by The Kramer-Trenton Company, Trenton, N. J. The new publication contains information on how to eliminate water on any size refrigeration or air conditioning system through use of the Kramer "Unicon," a self-contained remote type air-cooled condenser. The manual contains complete fact and photographic information.

For further information, circle 51 on Reader Inquiry card.

Dehumidifiers

DESCRIPTIVE sales literature on dehumidifiers has been issued by the Abbeon Supply Company, Jamaica, N. Y. It has information on appropriate uses of refrigerant and silica gel dehumidifiers, and recommends humidities for certain commodities.

For further information, circle 52 on Reader Inquiry card.

Bulletins on New Motors

THE recently announced G-E line of Tri-Clad "55" motors, built in 1-30 hp ratings to latest NEMA dimensions, are described in three new four-color picture-story bulletins available from the General Electric Company, Schenectady, N. Y.

The publications contain complete descriptions of new maintenance, performance, and protective features of the line, and each includes a double-spread cutaway drawing of the motors. A 16-page booklet, GEA-6013, covers dripproof models; enclosed motors are presented in GEA-6012, an 8-pager; and 14-page bulletin GEA-6027 describes the new gear motors. The Tri-Clad "55" will be available in large quantities after January 1, 1954.

For additional information, circle 54 on Reader Inquiry card.

Sealing Compound Catalog

A NEW 34-page catalog covering the entire line of Presstite Sealing Compounds for the refrigeration industry, including their complete line of odorless sealers, has been published by Presstite Engineering Company, St. Louis.

The illustrated catalog provides information on laboratory data, specifications and methods of application for 50 Presstite refrigerator sealants, including the various types of non-oxidizing Permagum, mastic sealers, plastic sealers, thermal mastics, elastic compound tape, beads and special shapes, wood sealers, insulation tape, Flexseal asphalt, barrier paper, washer type sealers, spotweld sealer, glazing compounds, and miscellaneous sealers.

Most of these compounds are unique in nature, having been developed and formulated to do a particular job to meet special conditions of use and application.

For additional information, circle 53 on Reader Inquiry card.

New Paint Stops Fire From Spreading

THOSE in the refrigeration and air conditioning industry who are interested in fire prevention will study with a great deal of interest the recent development of a new fire retardant paint applied by brush or spray to the interior of buildings and which, it is claimed, stops fire from spreading.

This paint is claimed to contain a mass of minute "built in" fire extinguishers; when exposed to flame Fyr-Kote pours out Carbon Dioxide and Calcium Chloride which smothers fire and retards the spread of flame right on the surface.

Fyr-Kote oil base fire retardant interior flat wall paint has been listed by Underwriters Laboratories and is identified with the Underwriters' label on every can.

For additional information, circle 67 on Reader Inquiry Card.

New Catalog on Bonding Cement

A COMPREHENSIVE new catalog describing its Enamelite, a cold mixed and applied two component bituminous bonding cement for bonding and vapor-proofing rigid low-temperature insulation to walls and ceilings in refrigerated buildings has been published by Presslite Engineering Co., St. Louis. First introduced in 1930, this product is described as an internal setting mastic which forms an impervious barrier against moisture-vapor infiltration, enabling insulation to maintain maximum efficiency and last indefinitely. The material maintains its volume constancy, develops a bonding strength in excess of 100 lbs. per square inch and remains tough, flexible and elastic. Also, it is claimed to be resistant to acids, alkalies, brine, salts and gases. The catalog includes laboratory data, specifications, and complete directions for application, as well as illustrations of jobs on which Enamelite No. 330 has been used.

For additional information, circle 78 on Reader Inquiry Card.

Rodent Repelling Bulletin

A NEW rodent repellent material Good-rite z.a.c. has been announced by the B. F. Goodrich Chemical Company, Cleveland, Ohio. This repellant, which is a zinc dimethyl dithio-carbamatic-cyclohexylamine complex, it is claimed, has outstanding properties. Active testing show that it may be effectively and economically incorporated into packaging materials where a taste repellent is practical.

For further information, Circle 77 on Reader Inquiry Card.

Solvents Label for Safety

'FOR Your Safety" is the headline which greets the shop man when he opens a drum of solvent produced by John B. Moore Corporation. In bold, black type on yellow background, the label enjoins against careless use of any solvent, tells precautionary measures to avoid dermititis, fires and toxic risk from fumes and, as well, urges him to call his safety engineer for counsel. This supplemental "safety" label refers to no specific product or brand.

For additional information, Circle 79 on Reader Inquiry Card.

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

★ *Saves Space*

★ *Saves Weight*

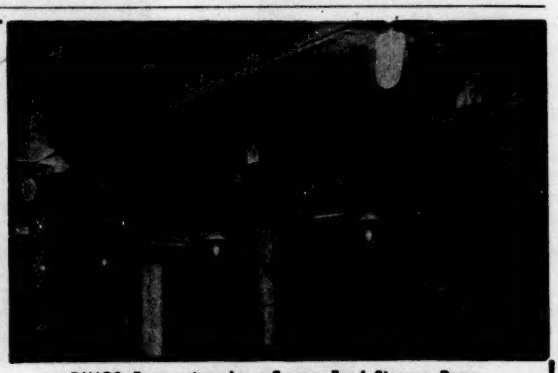
★ *Saves Cost*

CAN BE USED WITH ANY REFRIGERANT

Write for descriptive folder

DETROIT ICE MACHINE COMPANY

2615 Twelfth St., Detroit 16, Mich.



DIMCO Evaporators in a Frozen Food Storage Room at Great Lakes Terminal Warehouse, Toledo, Ohio. A typical installation facilitating palletizing.

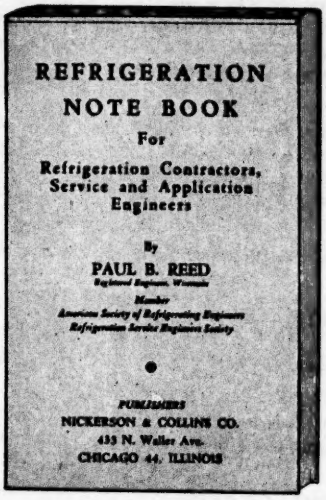
Circle No. 34 on Reader Service Card

Circle No. 40 on Reader Service Card

A Vest Pocket Book of Valuable Data

REFRIGERATION NOTE BOOK

by **PAUL B. REED**



Vest Pocket Size—3¼ x 5 inches
204 Pages—Flexible Binding

THIS NOTE BOOK of condensed refrigeration information represents many years of work in accumulating practical data—"culling out" all extraneous material—so as the author states, "the reader will find a handy and easily carried source of information not usually kept in memory."

You will be surprised at the wealth of material that has been included in this convenient and practical reference Note Book. It is written in layman's language, without complicated formulas. In short, it is a tool responsible for the operation of refrigeration equipment.

$2.00 Postpaid

Nickerson & Collins Co., Publishers
433 N. Waller Ave., Chicago 44, Ill.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words, $2.00 per line for bold face headings. $15.00 per inch for line listings.

ICE PLANTS—for sale

FOR SALE—Mayer Ice Company plant at Frostburg, Md. Installed during late war, electrically operated; 320 cans. Will sell entire plant or equipment only. Any reasonable offer will be considered. Plant now in operation and can be inspected at any time. C. L. Young, 1 W. 11th Ave., Baltimore 25, Md.

FOR SALE
ICE & LOCKER PLANT
in Virginia; $64,000 volume.
Write
NICHOLS
& Associates, East, Inc.
441 Lexington Ave. New York 17, N. Y.
Broker Participation Invited

USED EQUIPMENT—wanted & for sale

FOR SALE—1056 ice cans 11½x22½x57 ID; 2 Gifford-Wood type F 400 lb. scoring machines; 2 Connersville 1.65 Cu. Ft. blowers with 15 h.p., 220V motors; 1 Allis-Chalmers water pump 500 GPM 52 Ft. head with 10 h.p. 220V motor; 1 ice tiering machine, will take 2—400 lb. cakes, ten tiers high. Priced right for quick sale. National Ice & Fuel Corp., 38 S. Dearborn St., Chicago 3, Ill.

FOR SALE—12½x14½ York compressor with synchronous motor; 125 ton shell & tube condenser, 30 KW Diesel electric generating set; two 2 h.p. Copeland Freon compressor sets; two Kramer blower coils. Priced for quick sale. Address Box DC-9, c/o Industrial Refrigeration.

FOR SALE
COMPLETE ICE MAKING UNIT
Direct connected horizontal Vilter compressor, 10½" x20", #161681—driven by a 100 h.p. synchronous Ideal motor, #45518, V4000 P.F. 100-60 cycle—120 r.p.m. One exciter—#45519—220 V motor, generator type D.C.V. 125 panel board for same.

COMPLETE ICE MAKING UNIT
9½"x9½" horizontal Vilter compressor, #359731, V belt driven 225 r.p.m. with both V pulley and flat. Westinghouse synchronous motor 440V—60 H.P. —3 phase 900 r.p.m. serial #4821901. Starting panel for same.

INCOMPLETE ICE MAKING UNIT
6x6 York compressor #21297. 25 h.p. General Electric motor #231162, 220 V., 1200 r.p.m., starter missing. 3—50 KVA transformer, serial #626458 3.2 per cent at 220 V. All equipment in very good condition.

ELECTRIC ICE COMPANY
PRICHARD, ALA.

FOR SALE—10"x7" Worthington booster compressor. 4x4, 5x5 Fricks. 3x3 self-contained York. 7½x7½, 8x8, 9x9 Yorks, splash lubrication. 15 ton shell & tube condenser. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—One General Electric Motor 15, h.p., one pump and motor, 3 h.p., one brine pump, 6x6 York compressor complete with receiver and V-belts, one 15 h.p. starter box. Equipment in first class shape; has had very little service. Write Box 1107, Oklahoma City, Okla.

USED MACHINERY—continued

FOR SALE—9x9 and 10x10 Frick ammonia comp. in good condition, with or without on shaft 300 r.p.m., 4,000 volt synchronous motor. North Pole Ice Co., Clarksburg, W. Va.

FOR SALE—Uline scoring machine for 300 lb. blocks. Used 3 years. Price $500.00. Rawlings Ice Company, Alliance, Nebr.

WANTED—500 used 400-lb. cans in good condition. Also, need two 400-lb. 2-can dumps. Have almost new 300-lb. cans to sell or trade. Girton-Adams Ice Co. Sioux Falls, S. Dak.

FOR SALE—York high and low speed 7½x7½ with motors, 9x9 high and slow speed with motors, 12x12 with motor, 6x6 high speed; self-contained units; ice cans; brine coolers; cranes; condensers; agitators; blowers. Parke Pettegrew & Son Company, 370 W. Broad St., Columbus 8, Ohio.

FOR SALE—COMPLETE ICE PLANTS
20 tons to 150 tons
AMMONIA COMPRESSORS
12½x14½ York, ½ & ⅔ capacity control.
8x8 York, V-belt drive to 75 h.p. motor with reduced voltage starter.
7½x7½ York, V-belt drive to 60 h.p. motor.
6x6 York high speed—3x3 & 4x4 self contained units.
MISCELLANEOUS EQUIPMENT
130 h.p. 3 cylinder Superior Diesel engine 600 r.p.m.
75 h.p. synchronous motor, 300 r.p.m.
75 h.p. motor, 720 r.p.m.—11½x22½x45" ice cans.
(2) Buda-Lanova 30 KW Diesel generators.
JOHN F. CARSON
"A" & Venango St. Philadelphia 34, Pa.
Phone GArfield 6-2221

FOR SALE
USED ICE PLANTS AND REFRIGERATING EQUIPMENT

30 ton Ice Plant 360-300 lb. Ice Cans—4 Can Pull—Diesel Driven
40 ton Ice Plant 552-300 lb. Ice Cans—6 Can Pull—Diesel Driven
50 ton Ice Plant 616-300 lb. Ice Cans—7 Can Pull—Electric Driven
85 ton Ice Plant 1040-300 lb. Ice Cans—26 Can Pull—Diesel Driven

AMMONIA COMPRESSORS—HIGH SPEED

2—3x3 Frick Type H	2—4x4 York Y-28
5x5 York Y-28	5x5 York Y-35
6x6 York Y-26	6x6 York Y-28
6½x6½ York Y-28	6½x6½ York Y-38
7x7 Frick Type H	7½x7½ York Y-15
8x8 York Y-26	8x8 York Y-28
10x10 York Y-28	12½x14½ York Y-26

9x9 Frick type H capacity control D.C. 100 H.P. 360 RPM Syn. Motor
9x9 York Y-28 capacity control D.C. 100 H.P. 300 RPM Syn. Motor
10x10 York Y-16 D.C. 100 H.P. 200 RPM Syn. Motor
10x10 York Y-16 D.C. 70 H.P. 180 RPM Syn. Motor
10x10 York Y-28 D.C. 100 H.P. 300 RPM Syn. Motor

ICE CANS
700 11x22x47" 300 lb. Excellent Condition
100 11x22x51" 300 lb. Excellent Condition

Shell & Tube Ammonia Condensers, Brine Coolers, Receivers, Traps, Valves & Fittings
1—Miller Perfection Ice Scoring Machine
Write, wire or cable us on any equipment you need

ENTERPRISE EQUIPMENT CORP.
77-79 Alexander St. Yonkers 8-8118-9
Cable Address: ENEQCO Yonkers, N. Y.

VAN RENSSELAER H. GREENE
ENGINEERS
COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT
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FRED OPHULS & ASSOCIATES
Consulting Engineers
112-114 West 42nd St. New York City 36
Ice Making and Refrigeration
Industrial Power Plants
Reports, Appraisals and Management

How VILTER helps cool concrete for World's Second Largest Hydro Plant

Growth and development in the Pacific Northwest have been so fast that electric power is badly needed. Primarily to ease the shortage, the Corps of Engineers of the U. S. Army is supervising construction of government-owned Chief Joseph Dam at Bridgeport, Washington. 51 miles downstream from Grand Coulee Dam, Chief Joseph Dam will incorporate the second largest hydro-electric power generation facilities in the world—a total rating of 1,728,000 kilowatts.

Cooling the 1,700,000 cubic yards of concrete that will be poured would be a tremendous undertaking if brine pipes were incorporated in the forms. Instead, the contractors are chilling the concrete aggregate to 40° before pouring. The dry aggregate is cooled with an air blast, the mix water is chilled, and Crystalform PakIce from Vilter PakIcers is added to the mix. Vilter VMC compressors carry their share of the refrigeration load.

Most likely you'll never be pouring enough concrete to need PakIce for the mix. But if you need ice in your plant for your product or for latent storage, chances are you can make it better and at less cost with Vilter PakIcers. If you use refrigeration and demand dependability, you can have it—and save money on operation and upkeep—with Vilter. Thousands upon thousands of plants of all kinds save money with Vilter. Probably you can, too.

Joint contractors in Chief Joseph Builders are The Arundel Corporation, L. E. Dixon Company, The Hunkin-Conkey Construction Co., and American Pipe and Construction Co. Vilter Distributor in the area is W. E. Stone & Co.

Vilter.

Your nearby Vilter Distributor or Representative will be glad to show you how you can save with Vilter.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, MILWAUKEE 7, WIS.

Air Conditioning • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Double Pipe Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pakicers • Pipe Coils • Valves & Fittings

Circle No. 35 on Reader Service Card

ADVERTISERS

American Bitumuls & Asphalt Co. 8
Armstrong Cork Co. ..... Inside Back Cover

Bateman Foundry and Machine Co., Inc. 27
Bower Chemical Mfg. Co., Henry 26
Butcher Boy Refrigerator Door Co. 1

Caterpillar Tractor Co. 10
Chicago Nipple Mfg. Co. 54
Chip Ice Corp. 46
Classified Advertising 63

Dersch, Gesswein & Neuert, Inc. 49
Detroit Ice Machine Co. 62
DuPont de Nemours & Co., Inc., E. I., Polychemicals Dept. 23

Enterprise Equipment Corp. 63

Frick Co. 32

Greene, Van R. H. 63

Index Coupon & Supply Co. 38
International Salt Co., Inc. 55

Jamison Cold Storage Door Co. ..... Back Cover

King-Zeero Co. 55
Knickerbocker Stamping Co. 52
Kramer Trenton Co. 9

National Pipe Bending Co. 49
Niagara Blower Co. 35
Nickerson & Collins Co. 63

Ohio Galvanizing & Mfg. Co., The 29
Ophuls & Associates, Fred 63

Perfection Ice Scoring Machine Co., The 26
Permamix Corp. 46
Phillips & Co., H. A. 54

Rempe Co. 56
Reynolds Manufacturing Co. 29

S & S Vending Machine Co. 56
Shank Co., Cyrus 32
Sporlan Valve Co. ..... 2nd Cover
Sun Oil Co. 4

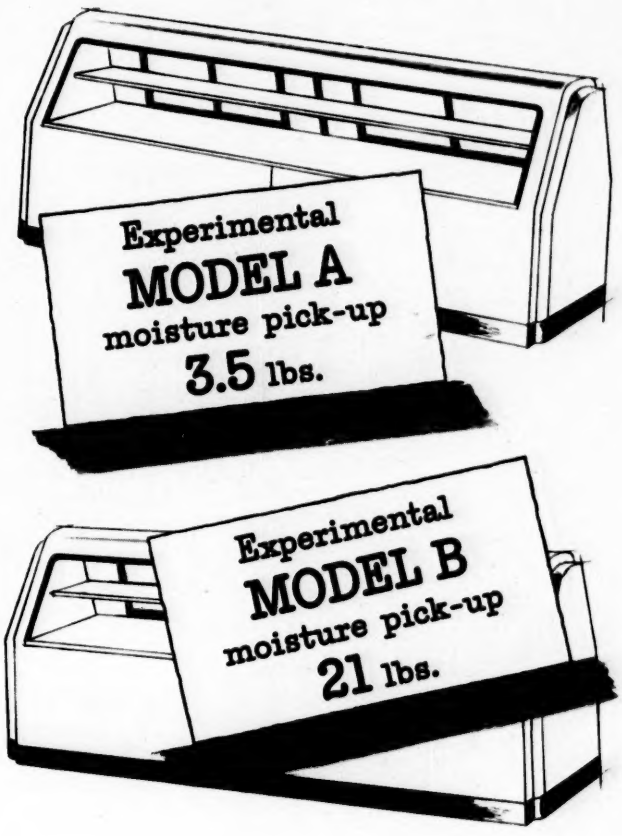
Taylor Instrument Companies 35

Union Bag & Paper Corporation 2

Vilter Mfg. Co., The 64
Vogt Machine Co., Inc., Henry 12
Voss Co., Inc., J. H. H. 50

Wanted and For Sale Advertising 63

These tests help you build better equipment



A manufacturer, interested in marketing a new type of meat display case, developed two basic designs. Theoretically, both models should have been equally efficient. Rather than take chances, however, the manufacturer decided to test the performance of both units under actual operating conditions in Armstrong's "Life Test."

In a few months' time, Armstrong put the two units through a series of tests that approximated five years of hard usage. The results established that although the cases looked alike, one model was definitely superior. Model "A" had a moisture pickup of 3.5 lbs., while Model "B" picked up 21 lbs.

The poor showing of model "B" made the manufacturer's choice an easy one. He was able to go right into production with the more efficient case—thus saving many dollars and immeasurable customer good will.

Operational difficulties can develop in the best designed low-temperature equipment. You can avoid these troubles before going into production, by sending your pilot models to Armstrong for a series of life tests. You'll receive detailed results in a confidential report. There is no charge; the only requirement is that one of the models submitted be insulated with one of Armstrong's equipment insulations—LK® Corkboard, Fiberglas*, or Temlok®. For complete details, write Armstrong Cork Company, 3012 Skye Drive, Lancaster, Pennsylvania.

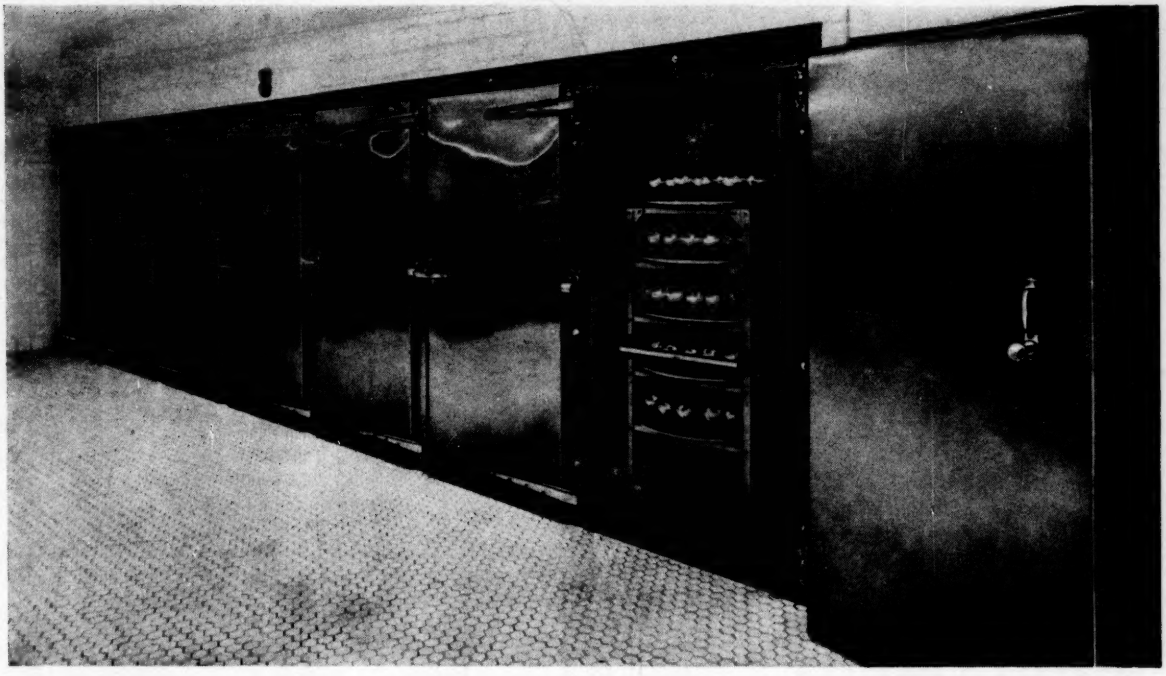
The free booklet, Armstrong's Equipment Insulations, fully describes the Life Test and contains valuable information on Armstrong's insulation products. Write for your copy today.

* ® OCFCorp.

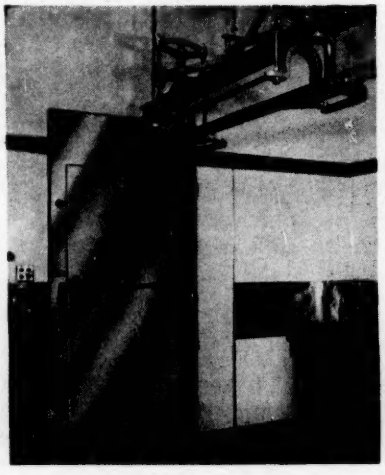
ARMSTRONG'S EQUIPMENT INSULATION

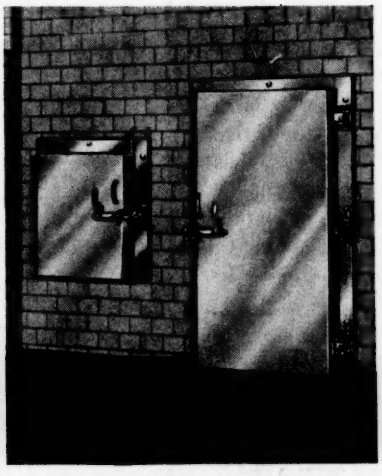
LK CORKBOARD • FIBERGLAS* • TEMLOK

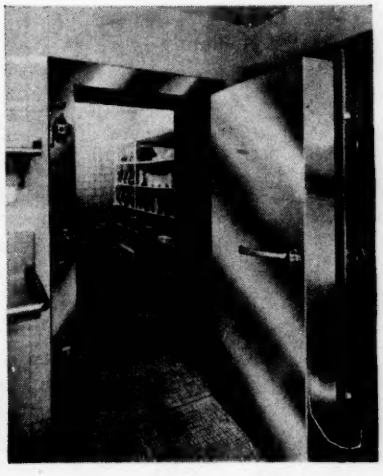
Circle No. 12 on Reader Service Card



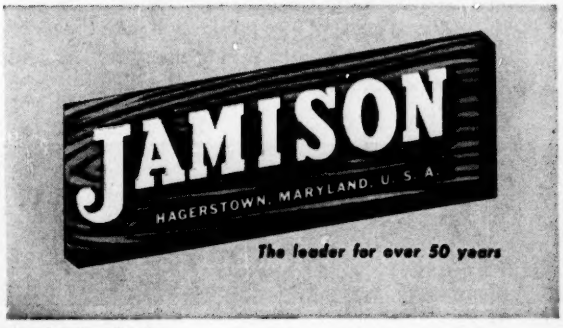
Have Stainless Beauty + JAMISON Efficiency in 1 Door







Whether you need a door for coolers—frozen food storage to 0°F—or sharp-freezing operation to as low as −40°F you can have it PLUS by specifying the super-sanitary, easy to clean, beauty of stainless steel cladding in JAMISON Standard, JAMISON Lo-Temp or JAMISON Super Freezer Doors. For complete information, specifications and dimensions, write outlining your type operation to Jamison Cold Storage Door Company, Hagerstown, Maryland.



Circle No. 13 on Reader Service Card